

ARMY RESEARCH AND DEVELOPMENT



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5 Generals Head Reorganization Implementation Groups

Army Slates Symposium On Limited-War Mission

"The U.S. Army's Limited-War Mission and Social Science Research" is the theme of a classified symposium scheduled in Washington, D.C., Mar. 27-28-29, under auspices of the Chief of Research and Development.

Approximately 300 invited representatives of the Department of Defense, Government executive agencies, non-Government social science institutions and Army agencies have indicated they will participate.

Assistant Secretary of Defense for International Security Affairs Paul Nitze, Deputy Assistant Secretary of Defense Dr. Henry S. Rowen, Secretary of the Army Elvis J. Stahr, Jr., and a number of other high-ranking dignitaries are listed on the agenda as guest speakers.

Session chairmen will be Dr. Leonard Cottrell, Russell-Sage Foundation; Dr. W. Phillips Davison, Council for Foreign Relations, Inc.; Dr. Ithiel de Sola Pool, Center for International Studies, Massachusetts Institute of Technology; and Dr. Klaus Knorr, Center of International Studies, Princeton University. Dr. Roger W. Russell, Department of Psychology, Indiana University, will preside at the symposium dinner.

Among dignitaries scheduled to present papers are: Dr. Irwin Altman,
(Continued on page 3)

Congress has tacitly approved the plan for broad reorganization of the U.S. Army by permitting the legal time limit of 30 days from notification to pass without stating opposition to the proposed changes.

Armed Services Committees of the Senate and the House had been thoroughly briefed on the plan prior to public announcement Jan. 16.

Effective Feb. 19, five general officers designated by order of Secretary of the Army Elvis J. Stahr, Jr., assumed their duties as chairmen of the formal planning groups to begin implementing the plan.



Lt Gen David W. Traub

Comptroller of the Army Lt Gen David W. Traub is project director for the detailed planning and conduct of the reorganization which is scheduled for accomplishment within an 18-month period. He will report on progress through the Chief of Staff to the Secretary of the Army.

General Traub also is chairman of the planning group on reorganization for Headquarters, Department of the Army
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WRAIR Opens Institute For Dental Research

Coincident with the 51st anniversary of the founding of the Army Dental Corps, an Army Institute of Dental Research was dedicated Mar. 3 at Walter Reed Army Medical Center, Washington, D.C.

Lt Gen Arthur G. Trudeau, Chief of Research and Development, was guest speaker at the formal dedication ceremonies. Maj Gen Joseph L. Bernier, Chief of the Army Dental Corps, stated the Institute's function by saying:

"This Institute will enable us to meet the increasing need for more extensive research in the field of dentistry. Its main objective is to continue to find means of reducing the incidence of oral disease, with emphasis on prevention, and to devise simplified techniques which will permit rapid and effective dental treatment, including injuries to the jaw."

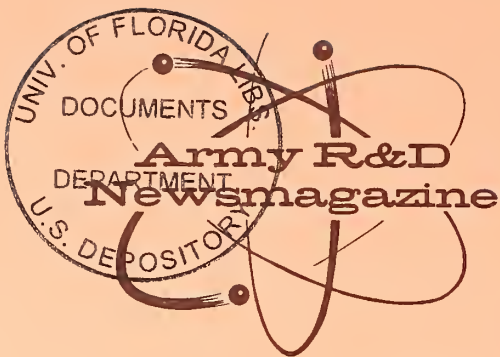
Future plans related to the Institute include the establishment of five subordinate research activities in existing military facilities. These activities are now scheduled to be located at Walter Reed Army Medical Center, Washington, D.C.; Brooke Army Medical Center, Fort Sam Houston, Tex.; Fort McPherson, Atlanta, Ga.; St. Louis, Mo.; Alameda, Calif.



Lt Gen John P. Daley

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Society Needs the Great Whales Who Plunge Into Darkness . . .

By Dr. Ralph G. H. Siu

Technical Director, R&E, Office, Quartermaster General

Men have always been fearful of the darkness of the unknown and sought comfort in the light of a clearly defined objective, in the beacon of a tried and proven path, and even in the roving spotlight of publicity and the cliché. This is understandable. And it is also understandable should the men in research and development, being all too human, reflect the same fears and preferences. The bright surface feels so much safer.

But society needs the great whales who plunge into the darkness of the depths. We must recognize them and let them dive. This thought has been echoed throughout the ages and has been expressed in many contexts:

I like all men who dive. Any fish can swim near the surface, but it takes a great whale to go down five miles or more.
—Herman Melville, Novelist.

When it is dark enough you can see the stars.—Charles A. Beard, Historian.

The darkness is light enough.—J. H. Fabre, Entomologist.

The present discussion attempts to trace the spirit of these quotations from two contrasting directions. One is drawn from physical analyses of mythological heroes; the other from botanical research on photoperiodism.

In the realm of the psyche things are indefinite and not fully known and are therefore expressed through symbols. These symbols do not have a fixed meaning but undergo many variations and analogies. The more of these a given symbol can assume, the clearer the image of the object it projects. For this reason psychiatrists have spent much effort toward analyzing the mythical beliefs of man, which are replete with symbolism of all kinds.

One of the most pertinent of these studies concerns the mythical hero. The stories all follow the same general pattern: The hero goes on a sea journey, fights the sea monster, is swallowed, continues the fight within the monster, finds a vital organ and destroys it or overcomes the monster by lighting a fire inside him. Finally a bird guides the hero to sunlight. A typical tale is the Polynesian myth of Rata, as described by Leo Frohenius:

. . . Once more they continued on their journey, but a still greater danger awaited them. One day the valiant Nganaoa cried out: "O Rata! Here is a great whale!" Its huge jaws were wide open, the lower jaw was already under the boat, the upper one was over it. Another moment and the whale would have swallowed them. Then Nganaoa, the "slayer of monsters," broke his spear in two, and just as the whale was about to crush them he stuck the two pieces in his enemy's gullet, so that he could not close his jaws. Then Nganaoa leapt into the maw of the great whale and peered down into his belly, and what did he see? There sat his two parents, his father Tairitokerau and his mother Vaiaroa, who had been swallowed by this monster when out fishing. The oracle had come true. The voyage had reached its goal. Great was the joy of the parents of Nganaoa when they beheld their son, for they were now persuaded that their liberation was at hand. And Nganaoa, too was bent upon vengeance. Taking one of the two sticks from the animal's gullet—the other was enough to prevent the whale from closing his jaws and to keep the passage clear for Nganaoa and his parents—he broke into two pieces for use as fire-sticks. He told his father to hold one piece firmly below, while he himself manipulated the upper one until the fire began to glimmer. Then, blowing it into a flame, he hastened to heat the fatty parts inside the belly with the fire. The monster, writhing with pain, sought relief by swimming to land. As soon as it reached the sandbank, father, mother and son stepped ashore through the open gullet of the dying whale.

The lesson of the myth seems clear. It is in the dark that a person gains enlightenment. To find what he is really seeking, a person must be there and must brave it. In the belly of the whale Jonah saw the "mighty mysteries."

Another fascinating confirmation of this ancient wisdom has been demonstrated in recent times in the laboratory itself. The relevant experiments involve the flowering response of plants.

Some plants, such as barley and wheat, flower only when the day is long and the night is short. Others, such as soybean and chrysanthemum, flower

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5 Generals Head Implementing Groups for Army Reorganization

(Continued from page 1)

Army. Other chairmen are: United States Continental Army Command, Maj Gen Richard D. Meyer; Materiel Development and Logistic Command, Maj Gen Frank S. Besson, Jr.; Combat Developments Command, Lt Gen John P. Daley; Office of Personnel Operations, Maj Gen G. E. Martin.

General Meyer is assigned as Deputy Chief of Staff for Logistics, United States Continental Army Command Headquarters, Fort Monroe, Va. General Besson currently is Chief of Transportation and General Daley is Deputy Commanding General for Developments at Hq USCONARC. General Martin is Director of Officer Assignments, Office of the Deputy Chief of Staff for Personnel, Department of the Army.

The order designating General Traub states that he "is authorized to establish planning requirements, obtain administrative support, and make other arrangements as required to direct and coordinate the implementation of the reorganization."

As stated in the January issue of the *Newsmagazine*, an informal planning committee headed by Col Wilson R. Reed is developing suggested plans for reorganizing research and development, and will serve in an advisory capacity to the chairmen of the formal planning groups. Col Reed is Deputy Chief of the Management Analysis Division, Office of the Chief of Research and Development.

Other OCRD personnel designated in mid-February to work with the formal planning groups include: Col Edward Duda, Chief of the Plans Division, whose additional duties as Chairman of the Ad Hoc Committee on Army Materiel Testing were concluded Feb. 15; Col R. B. Firehock, Deputy Director of Developments; Col H. M. Merritt, Chief of the Manpower Branch, Manpower and Personnel Division; Col E. W. King, Chief of the Long-Range Plans Branch, Plans Division; Lt Col R. H. Bingham, Chief of the Programs Branch, Programs and Budget Division; and Maj S. K. McMurdo, Assistant for Officer Career Planning and Education.

Representatives of other Army R&D agencies to serve on the formal planning groups were being selected as the *Newsmagazine* went to press, but information regarding identity of the nominees was not available. Briefings within all of the agencies were scheduled to begin late in February.

The Directive states that the site



Maj Gen George E. Martin



Maj Gen Richard D. Meyer



Maj Gen F. S. Besson, Jr.

selection plan is to be forwarded to the Department of the Army Reorganization Project Office by Mar. 20. It states that Headquarters of the Combat Developments Command and the Materiel Developments and Logistic Command "should be located in the general vicinity of Washington, D.C." Existing facilities will be used because new construction funds are not available through FY 1963.

Responsibility for selection of head-

quarters facilities for each of the new commands is assigned to the Deputy Chief of Staff for Logistics. Department of the Army Reorganization Directive No. 210-1, dated Feb. 9, requires that DCSLOG will coordinate with chairmen of the Combat Developments Command, Materiel Developments and Logistic Command, and the U.S. Continental Army Command planning groups to determine availability of sites.

Army Schedules Symposium on Limited-War Mission

(Continued from page 1)

Special Operations Office, The American University; Dr. Lucian E. Pye, Center for International Studies, Massachusetts Institute of Technology; Brig Gen Richard Stilwell, United States Military Academy; Dr. Frederick Yu, Montana State University; Dr. Harley O. Preston, American Institute for Research; Dr. Harry Eckstein, Center of International Studies, Princeton University; and Dr. Fred Greene, Department of Political Science, Williams College.

Military presentations are scheduled by Lt Col George Casey, Long-Range Planning Group, Deputy Chief of Staff for Personnel, Department of

the Army; Lt Col J. T. Little, Special Warfare Center, Fort Bragg; Col R. H. Slover, Plans and Doctrine Division, Civil Affairs; and Col W. H. Kindard, Jr., Director of Special Warfare, Deputy Chief of Staff for Operations, Department of the Army.

Chief of Research and Development Lt Gen Arthur G. Trudeau will make the address of welcome, and Director of Army Research Maj Gen Wm. J. Ely is programmed for closing remarks.

The Special Operations Office, American University, Washington, D.C., is hosting the symposium in behalf of the Human Factors Research Division, U.S. Army Research Office, Office of the Chief of Research and Development.

Society Needs the Great Whales . . .

(Continued from page 2)

only when the day is short and the night is long. Flowering is, of course, the plant's expression of creativity. And the question arises whether it is the light of the day or the darkness of the night that is crucial for flowering—for creativity at the fundamental level of life. Experiments have been completed which provide a most revealing answer.

When the light period was interrupted by darkness, the flowering response of the plant remained unaffected. When the dark period was interrupted by so much as a minute of light, flowering ceased. It is the dark that determines!

Thus, we bring ourselves full cycle—from the safety of the light, through the darkness of primordial images, to the demonstration in the laboratory. As the temporal wheel slowly turns, we keep hearing the voice from the long past repeating the identical theme—appropriate for the month then and appropriate for the Army R&D *Newsmagazine* Theme of the Month feature.

19-Point Program Proposed to Improve ASTIA Service

Critics of the Armed Services Technical Information Agency may have their most earnest exhorter as well as their most understanding and sympathetic listener in ASTIA's Commanding Officer, Col James O. Vann.

In the belief that ASTIA needs dynamic action to broaden its functions and capabilities, Col Vann has proposed a 19-point program aimed at continued improvement of service to ASTIA users over a 2-year period.

Scientific information officers representative of ASTIA's customer agencies gathered at Arlington Hall Station, Va., Feb. 1, to hear Col Vann outline the plan he has submitted for Department of Defense consideration. Bluntly and repeatedly, he stated that ASTIA presently lacks the capability of adequately doing its job. He said:

"Published and sampling evidence indicates that about half of the effectiveness of the engineers and scientists making our weapon systems is lost because ASTIA does not have the resources of getting the right information to them at the right time, in the right amount, in the right form.

"In terms of the technical manpower working on the DOD weapon systems, this loss subtracts about 150,000 man-years from the total effort of the 300,000 engineers and scientists involved. In terms of money, this loss is estimated at between \$1 and \$2 billion each year. In terms of time, this loss is estimated to be at least one year of the 5-year development cycle of a weapon system."

Advocating "immediate decision" on support of a complete Department of Defense central technical information system adequately geared to national security, Col Vann said such a DOD center is essential to effective decision processes for weapon systems.

"The findings of the Humphrey Reports prepared for the Senate Committee on Government Operations," Col Vann said, "critically review the status of ASTIA and these findings are valid." He advanced his 19-point ASTIA program as a "constructive reply to the Humphrey Reports."

If the program is directed with adequate resources and priorities, Col Vann believes that "in one year thousands of technical man-years can be saved, and in two years . . . will approach the asymptote of manpower savings."

A complete central information system, it was stated, will result in engineers and scientists making an interchange of current findings and ideas and improve decision-making for operational effectiveness.

Other benefits of the plan as envisaged by Col Vann would include: identify information sources, improve schedule planning, afford opportunities, compress time between discovery and application, save time in solving problems, prevent negative results, stimulate creativity, increase productivity of resources, and identify gaps in technical efforts.

"The DOD should have access to up-to-the-minute data on all current as well as all completed research, de-

velopment, test, and evaluation work supported by DOD resources," Col Vann said. "This access to technical information must be fast, complete and accurate for use by engineers and scientists."

Despite this need, owing to limited resources ASTIA requires about three months for normal processing of technical reports from receipt to dissemination. The 19-point plan would reduce the time to "one month or less." Similarly, it would reduce from 18 working days to one the processing time for routine service on technical queries from scientists or engineers—and to one hour for emergency requests.

The Soviet Union, Col Vann stated, currently is employing approximately 40,000 professionally trained personnel in processing and disseminating technical information. About half are translators. To compete successfully, it is estimated that the U.S. ultimately will have to develop a total scientific information force of about 20,000 highly trained specialists.

ASTIA now has 365 manpower spaces, operates on a \$3 million annual budget, and occupies 102,000 square feet of floor space. Immediately needed to provide more adequate service, Col Vann said, are 960 additional manpower spaces and 200,000 feet of floor space for the national information program.

Currently ASTIA furnishes service to "less than 17 percent of the DOD prime and associate contractors" and acquires "less than 19 percent" (27,000 technical reports a year) of the total technical reports produced by DOD prime and associate contractors. "Complete service," as viewed by Col Vann therefore, would increase the ASTIA workload by a factor of five.

Further, it was stated, ASTIA receives practically no technical reports from the estimated 300,000 sub and lower tier subcontracts. These reports total an estimated 150,000 annually. Complete acquisition and dissemination thus would increase by an additional factor of five the present ASTIA workload.

ASTIA has no information on current technical work performed by Department of Defense Contractors, that is, contractual work being performed now by the scientists and engineers in the prepublication stage.

"The Department of Defense should afford what has to be done to assure complete use of all our technical information," Col Vann stated in summary. "We cannot afford less."

SARS Fellowship Program Lauded as Career Aid

Dr. Edward W. Ross, Jr., employed as a mathematician at the Watertown Arsenal Laboratories, Watertown, Mass., believes that the Secretary of the Army Research and Study Fellowship program offers Army scientists an excellent opportunity to advance their careers.

Recipient of a SARS Fellowship for advanced study in England, Dr. Ross returned recently from a year of research at Kings College of Durham University. His studies were in the mathematics of large deflections; research was in the related field of elastic stability.

A paper titled "Asymptotic Representation of Certain Real Integrals with Variable Limits of Integration," authored by Dr. Ross, is scheduled for publication in "Proceedings of the Edinburgh Mathematical Society."

The SARS Fellowship enabled Dr. Ross to confer with a number of

well-known European scientists in the field of applied mathematics and mechanics. His visits included Glasgow University, the Royal College of Science and Technology in Scotland, the Technical University in Delft, Holland, and Federal Institute of Technology, Zurich, Switzerland.



Dr. Edward W. Ross, Jr.

Noted Dermatologist Joins Army Medical Service

Dr. Marion B. Sulzberger, internationally known for his research and teaching in dermatology and allergy, has joined the U.S. Army Medical Service as Technical Director of Research.

The announcement of his appointment said he will serve as principal adviser to The Surgeon General and the Chief of Research and Development on all scientific and technical matters related to medical R&D.

Dr. Sulzberger carries an illustrious career into his new assignment. Some of the high points are: Prosser White Orator, British Association of Dermatology, Royal Society of Medicine in London (1949); Ritter Von Zumbusch Memorial Lecturer, University of Munich, Germany (1954); Lloyd Detron Lecturer, Johns Hopkins University Medical School (1959); Dohi Memorial Lecturer, Japan (1960); Paul O'Leary Memorial Lecturer, Mayo Clinic (1961).

Awarded the Commander of the Star of Anjouan by the French Foreign Minister, Dr. Sulzberger also holds the Legion of Merit and Permanent Citation from the U.S. Navy, and the Decoration of Chevalier of the Legion of Honor presented by the President of the Republic of France.

Founder and past president of the Society of Investigative Dermatology, and past president of the American Dermatological Association, he is a present or past member of numerous biology and medical societies. He has served as: Chairman, Committee on the Cutaneous System, National Research Council; member, Allergy and Immunology Study Section and the General Medicine Study Section of the National Institutes of Health, U.S. Public Health Service; and Chairman, Committee on Filmed and Televised Case Presentations, International Congress of Dermatology.

Following more than four years World War II active duty with the U.S. Naval Reserve Medical Corps, he resumed private practice and became Professor of Clinical Dermatology and Syphilology at New York Post-Graduate Medical School, Columbia University. He also served as Professor and Chairman, Department of Dermatology and Syphilology, Post-Graduate School, New York University Medical Center, and Attending Physician at Bellevue Hospital, achieving Professor Emeritus status in 1960.

Dr. Sulzberger is a Fellow of the New York Academy of Medicine,



Dr. Marion B. Sulzberger

American Academy of Allergy, American Academy of Dermatology and Syphilology, and is President of the International League of Dermatological Societies. He is the author or coauthor of 12 medical textbooks, more than 300 scientific articles and monographs, and has served as editor or coeditor of the Year Book of Dermatology and Syphilology, the Journal of Investigative Dermatology, the Journal of Allergy, Current Medical Digest, Medical Clinics of North America, and a number of foreign professional journals.

Walter Reed Army Institute of Research Hosts Junior Science Symposium

Lt Gen Arthur G. Trudeau, Dr. Oliver J. Caldwell and Dr. Frank J. Snowden are among dignitaries scheduled to address the Junior Science and Humanities Symposium, Mar. 29-30, at Walter Reed Army Institute of Research, Washington, D.C. All will speak from 11 to 12 a.m. Mar. 30.

Discussing "Research in National Defense," General Trudeau will stress that he considers the Army's JSHS Program an invaluable means of building the Nation's scientific resources. Following approval of a proposal he submitted to Secretary of the

Army Elvis J. Stahr, Jr., General Trudeau last September issued a directive calling for broad expansion of the program.

Dr. Caldwell, Assistant Commissioner of Education and Chief of the Division of International Education, U.S. Office of Education, has selected as his subject "Education for Humanity." Dr. Snowden, Dean of the College of Liberal Arts, Howard University, Washington, D.C., will speak on "Challenge to the High School

Students of Today."

Dr. Rosaline M. Edwards, chairman of the Student Allocation Committee for the symposium, said that more than 175 science students and over 50 science teachers from the greater metropolitan area of Washington will participate.

The intensive 2-day session, the first Junior Science and Humanities Symposium of its kind ever held in the Nation's capital, will include presentations of professional papers by selected students, tours of research laboratories at Walter Reed Army Institute of Research, and a "curbstone clinic." Distinguished scientists will take part in the clinic to give students an opportunity of discussing careers in science.

A similar JSH symposium is scheduled Mar. 16-17 at Duke University, where the program originated under sponsorship of the Office of Ordnance Research, now the U.S. Army Research Office, at Duke, N.C. Other symposiums are slated Apr. 5-6-7 at the Agricultural and Technical College of North Carolina, in May at Picatinny Arsenal, and later in the spring at the U.S. Army Chemical Center, Fort Detrick, Md.



Dr. Oliver J. Caldwell



Dr. Frank M. Snowden, Jr.

Improved Mobile Weather Radar Has 400-Mile Range

A weather radar on wheels designed to track storms as far as 400 miles away for combat troops, and also monitor movements of clouds resulting from nuclear bursts, has been developed under contract by the U.S. Army Signal Research and Development Laboratory (USASRD).

The first unit of its kind specifically designed to be mobile, the set is a further improvement of the first weather radar which was developed by USASRD in 1946. It is housed in a standard 26-foot Army trailer and features a power-erected antenna mount that rises through the van's roof. It can be put into operation in less than an hour.

Nonmobile weather radars are used widely by the U.S. Weather Bureau and by the military as a basic forecasting tool. The Army's new unit has more than twice the detection capability of earlier mobile models, and can be moved rapidly from one strategic location to another.

It surveys a 600,000-square-mile area for oncoming bad weather and provides a display that allows weathermen to watch the progress of a storm. It can predict to within minutes when a storm will strike any point in this vast area.

The set also has a proven capability to detect and track clouds resulting from nuclear explosions, and could be extremely valuable for warning soldiers and civilians in potential high fallout zones.



Operator observes storm development at console of weather radar on wheels.

The radar electronically dissects a storm, showing its shape, indicating the density of precipitation at different points, its cross-sectional structure, and tracking the movement of the whole storm system. These features are shown on an array of TV-like display tubes inside the van.

The long-range search antenna can scan horizontally and vertically. At command of the operator, it can concentrate on a small sector to trace the movements of a particular storm area or cloud.

The set is now undergoing operational tests by the U.S. Army. It has been used successfully to track hurricanes and bad weather systems passing through the northeast U.S.

SC Develops LASER With High Power Beam

Possibility of the LASER becoming a dramatic communication medium of the future has advanced notably with development by the U.S. Army of a unit 300 times more powerful than any in general laboratory use. Laser denotes Light Amplification by Stimulated Emission of Radiation.

Announcement of a new superpowered 3-megawatt Laser, capable of a burst of 3,000,000 watts for less than one-millionth of a second, was made late in January by the U.S. Army Signal Research and Development Laboratory, Fort Monmouth, N.J.

Signal Corps research on Lasers has been increased substantially because it is theoretically possible for this high-powered light beam to increase many thousandfold present military communication capabilities. The Army also is interested in the exciting potential of the Laser for other military applications such as range-finding, space vehicle guidance and special purpose illumination.

Whereas ordinary light or radar beams, even with the best possible focusing, disperse at least 100 yards in a mile, a Laser beam is coherent and ordered. The Signal Corps reported that a pencil-thin Laser beam disperses less than two feet in a mile.

The new 3-megawatt Laser employs a laminated rotating mirror which limits the pulse peak power triggered within a prismatic crystal to less than one-millionth of a second. Lasers in laboratory use employ fixed mirrors to contain light for longer periods.

USASRD Units Establish Superior Safety Record

The U.S. Army Signal Research and Development Laboratory, which is engaged in hundreds of experimental activities, is maintaining an employee safety record far above average.

A recent safety audit made by the Office of the Chief Signal Officer, gave the Laboratory an Excellent rating. Twenty-one separate units, which employ some 1,100 persons in industrial-type work, were given Citations of Merit for completing a year without a disabling injury.

The awards made are limited to subdivisions which employ 15 or more persons. Special citations drawn up by F. Leland Burt, USASRD Safety Officer, were presented by Col James M. Kimbrough, Jr., Laboratory Commander, to 16 small units.



Soldiers set up a long-range search antenna atop a standard 26-foot trailer which houses the Army's new mobile weather observation radar equipment.

USASRDL Tests Plasma Effect on Communication

Scientists are shooting radio signals through a flashing tube of gaseous matter called plasma in studies of its radio characteristics at the U.S. Army Signal Research and Development Laboratory, Fort Monmouth, N.J.

Plasma is a form of electrically charged matter that is not found in high concentrations on earth, but which permeates more than 99.9 percent of the known universe. It can distort and block radio waves—in severe instances to the point of creating a radio blackout that could isolate a space ship from civilization for long periods.

Studies at USASRDL are aimed at determining plasma's radio characteristics so that more secure space communications systems can be designed for the future.

Plasma has been described as a fourth state of matter, with properties markedly different from solids, liquids or gases as they are found on earth. It is a sort of electronic soup

made up of atoms that have been split from their outer electrons.

To create high-concentration, high-temperature plasma for the research experiments, Dr. Rudolf Buser of the Army Signal Laboratory uses a huge condenser bank that delivers a 10-million ampere jolt of electricity that lasts for a millionth of a second. The electrical surge, which for that instant is 20 times greater than the output of Grand Coulee Dam, rips electrons from gas atoms in a glass cylinder.

A column of plasma three feet high and six inches wide appears with a bright flash of light. As the plasma forms, a radio signal is aimed through it and received on the other side. When the plasma is very intense, it completely blocks the radio signal, reflecting it back like a mirror. In smaller concentrations, the plasma distorts the radio waves.

Experiments allow scientists to measure in the laboratory plasma

phenomena that severely hamper message exchanges through vast distances in space. Tests also provide valuable information on the familiar muffling and fading of overseas broadcasts, caused by plasma irregularities in the earth's ionosphere.

Experiments not only reveal new facts about communications phenomena, but also will give scientists more basic information on the structure of plasma, how it forms and decays, and how it acts in magnetic fields.

Students Advised on Careers

Opportunities for scientific and engineering careers with the U.S. Army were outlined Jan. 26 to 250 eighth-grade boys and girls at Oakhurst School, Asbury Park, N.J., by a U.S. Army Signal Research and Development Laboratory employee.

Abraham Schwartz, on the technical staff of USASRDL Technical Director Dr. Harold A. Zahl, reviewed Army interest in various fields of science and stressed the need of specialization in preparing for a career in Army science.

Experimental Facsimile Unit Flashes Battle Pictures to Commanders

Battle sketches and pictures can be flashed by radio directly from frontlines to command headquarters by an experimental device developed as a result of interservice cooperation.

First of its kind small enough (27 pounds) to be packed on a soldier's back, the unit was designed by U.S. Army Signal Research and Development Laboratory scientists in cooperation with the U.S. Marine Corps for special land-sea missions. The device, known as Facsimile AN/GXC-5, transmits pictures as large as 8x11 inches to a distant receiver through most standard portable combat radios, or through a telephone line, in less than six minutes from a beachhead to a warship or to distant command headquarters.

In engineering tests at the U.S. Army Signal Research and Development Laboratory, Fort Monmouth, N.J., the new facsimile set transmitted high-definition battle maps from a radio-equipped jeep, even while the vehicle was in motion. Electrical power was supplied by the jeep battery.

The operator slips a picture or map into the unit, presses a button, and the picture is automatically wound around a roller where it is scanned electronically. The receiver unit reconverts electronic signals into an immediately usable picture. A carbon sheet automatically feeds face down onto the recording paper and three styluses, each resembling the tip of a ballpoint pen, draw the pic-

ture line by line on the back of the carbon paper. The print can be used directly as a master for standard multiple-copy duplicating machines.

Development of the new system, which is twice as fast as present com-

parable equipment, was under the direction of John Erhart of the U.S. Army Signal Research and Development Laboratory. The two experimental units were built to Army Signal Corps design by the Westrex Co.



Marine Sgts Joseph T. Fitzgerald (left) and John W. Scott test Army designed experimental photo transmitter under simulated combat conditions.

Universal Engineer Tractor Moves Into Serviceability Testing Phase

A priority RDT&E item in recent years will advance a long step this month when the first service test units of a Universal Engineer Tractor (UET) are delivered to the Corps of Engineers. Delivery to troops is projected for 1965.

The air-droppable, amphibious UET is designed to perform the operations of a bulldozer, grader, scraper, dump truck, prime mover, cargo carrier and combat vehicle under the most rugged conditions. It will come in two types—a 24,000-pound rubber-tired model and a 23,000-pound tractor-tread model. Both are designed to pick up earth ballast equal to double their weight and capacity.

Among the prime advantages of the UET in replacing a multiplicity of construction vehicles presently used by the Corps of Engineers in forward areas will be a great reduction in stocking of spare parts and easement of the maintenance problem.

Feasibility of rubber-tired ballastable tractor-scrapers was established following a draft of proposed requirements circulated to industry in 1956.

As a result, the first prototype model, using commercially available components, was developed under a contract awarded to Barnes and Reinecke with Le Tourneau-Westinghouse on a consulting basis.

Since then major improvements in the first of a series of six rubber-tired units to be used in field tests include:

- Provisions for troop-carrying capability.
- Provisions for amphibious operations (inland water).
- Sectionalization of the unit by use of flange-type connections, converting to basic types of Engineer equipment.

The advanced units, weighing 24,000 pounds each, were fabricated by the Caterpillar Tractor Co. Not until February 1961 was this firm given a contract to produce the six test units, the first of which is to be delivered this month.

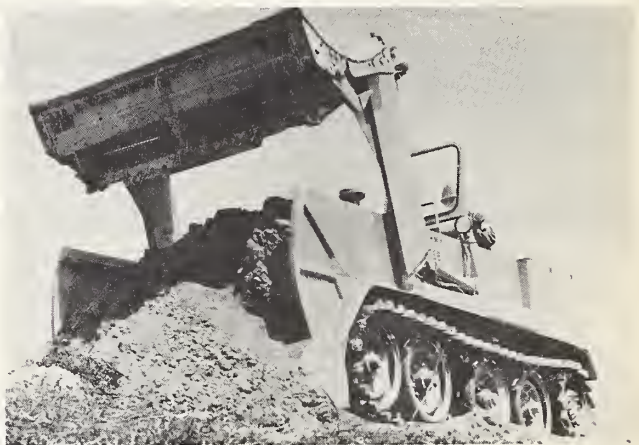
UET (Crawler)—A contract for the design and development of the crawler version of the UET was awarded to International Harvester Co. in May 1958. The crawler concept showed considerable promise because of its front-loading, mobility, amphibious and troop-transporting characteristics as well as other unique features.

The design of the second-generation prototype to be delivered this month features a front-loading scraper bowl, front-mounted dozer, positive-type ejection system, rear-mounted engine and drive train, and flat-track suspension with rear-drive sprockets.

A hydropneumatic suspension with lockout provides a



Rubber-tired tractor-scraper doubles as troop carrier, amphibious vehicle, cargo carrier, and combat vehicle.



Crawler UET displays front-loading characteristics.

sprung suspension for high-speed travel, and an unsprung suspension for low-speed scraper and dozing operations.

The tractor loads the scraper bowl (ballast compartment) and bulldozes by raising and lowering the hull in relation to the track and suspension system. The material at the outer sections of the cutting edge flows upward over the wells above the tracks, while the material in the center flows between the track well in scraper loading.

An Ordnance T-132 single-pin rubber-bushed track, which was designed for use on a series of 58,000-pound high-speed vehicles, is used on this tractor.

An armored version of the UET crawler is scheduled for delivery later this year after tests of the unarmored unit.

USAERDL Engineer Wins Achievement Certificate for Outstanding Performance

Maj Neal W. Sanders, Jr., was honored by the U.S. Army Engineer Research and Development Laboratories, Fort Belvoir, Va., at a recent ceremony prior to his departure for a new assignment in Atlanta, Ga.

He was presented with a plaque bearing the insignia of the Laboratories and a Certificate of Achievement in recognition of his work as military assistant in the Mechanical

Department during the period from Mar. 10, 1960 through Jan. 18, 1962.

The citation on the certificate stated, in part: "During this period, Maj Sanders' extraordinary initiative, technical knowledge, and dedication contributed greatly to the progress made on such items as the Universal Engineer Tractor, Combat Emplacement Excavator and Snow Tunnel Maintenance Equipment. In

addition, his skills and performance as a pilot, aeronautical consultant and liaison officer substantially enhanced the development of the Airborne Mine Detector by the Electrical Department and the solving of camouflage problems by the Military Department, thus reflecting great credit upon himself, the Corps of Engineers and the U.S. Army."

OTAC Tests Combat Vehicle Hydropneumatic Suspension System

By Robert J. Otto
R&E Directorate, OTAC

Fabrication and installation of the first hydropneumatic suspension system for combat and tactical vehicles has been completed and evaluation tests are being made by the Ordnance Tank-Automotive Command, Detroit, Mich.

A 42-ton rig is being used to test the experimental system. The rig incorporates the "flat track" suspension system in which the track returns over larger diameter road wheels rather than on support rollers.

Initial demonstrations of the new system indicate that the operating rig meets all originally envisioned objectives and may be the answer to the Army's desire for a breakthrough in track laying vehicle mobility.

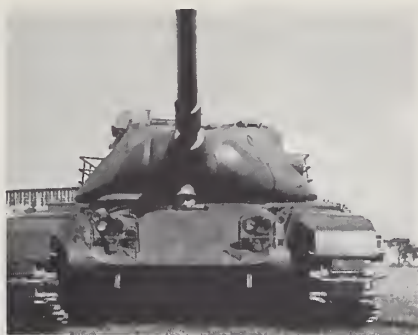
When development of a hydropneumatic suspension system was given high priority, OTAC engineers drafted the following objectives:

- **Single Compact Unit Construction.** Combining the functions of and eliminating the current externally mounted separate shock absorbers, shock absorber mounting brackets, torsion bar, torsion bar anchors, bump stop and bump stop brackets.

- **Weight Reduction.** Reducing the suspension to vehicle weight ratio from the 18-25 percent range to 15 percent or less.

- **Variable Ground Clearance.** Providing a variation of ground clearance, as measured from the underside of the hull, from zero (0) to 25 inches or more—thereby providing advantages in vehicle shipment, lower combat silhouette and improved vehicle mud and cross-country mobility.

- **Less Critical Hull Space.** Elimination of suspension components extending into the turret basket area and center of the vehicle, permitting greater versatility in vehicle design and a reduction in vehicle silhouette.



Hull lowered to create low silhouette.



Hull raised for high ground clearance.

- **Increased Cross-Country Speed.** Provide the means of substantially increasing cross-country speed through an infinitely variable spring rate, greater wheel travel and adjustable ground clearance.

- **Reduce Resistance to Propulsion.** Decreasing resistance to propulsion when operating in deep mud by eliminating many externally mounted suspension components.

- **Complete Gun Platform Stability Under All Firing Conditions.** Provide a suspension system that can be locked rigidly in any desired position during gun firing.

- **Extended Angular Elevation and Depression of Armament Systems.** Increasing total angular movement of vehicular mounted weapons by 20° without major vehicular design compromises.

- **Greatly Increased Mud Mobility.** Increasing the ground clearance to any designed height as a means of improving mud crossing mobility.

- **Increase the Load Carrying Capacity of Recovery Vehicles.** Utilization of the lockout capability, permitting the load that is to be lifted to react against a greater part of the stationary or rigid mass of the recovery vehicle.

The hydropneumatic suspension being tested consists of wheels individually sprung by means of hydraulic rotary actuators and accumulators (gas springs). Shock absorbers control pitch and bounce. These complete hydropneumatic units, including the wheel, wheel bearings and hubs, and road arms are installed or removed from the hull as a package.

Each wheel assembly incorporates a hydraulic vane-type actuator, two cam-operated leveling valves, a driver-operated wheel valve, damper valve and nitrogen-filled accumulator.

The hydraulic actuator converts rotation of the road wheel into movement of a column of oil in the hydraulic system. The valve section provides the leveling, damping and lockout. The accumulator gives the resilience provided previously by the torsion bar on the volute spring in the conventional suspension system.

When the vehicle is in "sprung" condition, cam-operated leveling valves maintain the vehicle ground clearance and desired height, regardless of load. For situations where a stable platform is desired for firing, the accumulators are hydraulically disconnected from the actuators, resulting in an unsprung or locked-out condition. Control of fluid volume in the rotary actuators governs the height and attitude of the vehicle.

To minimize the size and weight of the hydropneumatic suspension components, a high-pressure hydraulic system is used. For vehicles in the 45-ton class, pressures range from approximately 2,000 p.s.i. with wheels in static position to 5,000-6,000 p.s.i. in the maximum bump position.



Flexible suspension system lowered in rear to increase gun elevation.

3 Picatinny Scientists Recognized for Exceptional Service

Exceptionally competent and dedicated scientists and engineers are not exactly hard to find at bustling Picatinny Arsenal, Dover, N.J. That explains why top administrators found it difficult to narrow the field when asked to nominate three outstanding young scientists.

The request was made by the editor of the *Army Research and Development Newsmagazine*. It was prompted by a desire to give a bit of unofficial recognition, in the belief that thousands of scientists and engineers in the Army R&D establishment like to read about accomplishments of fellow workers.

After no small amount of ponderation, Picatinny Arsenal scientific administrators and Commanding Officer Col R. R. Klanderman nominated Dr. Jean R. Picard, Robert W. Vogel and H. William Painter. A great many others are almost equally deserving of recognition, it was emphasized.

Dr. Picard, serving as Deputy Chief of the Propellant Research Section, has directed research which led to development of a new propellant for the Hawk and Sparrow missile guidance systems. He coordinates activities of more than 75 employees in the artillery and rocket propellants field.

Winner of a Department of the Army Certificate of Achievement in 1957, Dr. Picard was recognized for his work in developing a process to manufacture HMX explosives. Later work led to an economical process for preparation of triaminoguanidine derivatives as an artillery and rocket propellant.

Prior to joining the Picatinny Arsenal to work in nitroamine chemistry in 1952, Dr. Picard was employed by the Canadian Armament Research and Development Establishment in Quebec. His work included a year of research in England in laboratories of the Explosives Research and Development Establishment.

A native of Quebec City, Dr. Picard received his B.A. degree in 1942 from Lavell University. A Province of Quebec fellowship enabled him to attend the University of Illinois. There he earned his B.S., M.S. and Ph.D. degrees, although he could neither read nor write English when he enrolled. His graduate work was in the field of synthesis-biochemical problems, leading to a doctorate in chemistry.

ROBERT W. VOGEL is Chief of the Ammunition Development Division at Picatinny. The division is responsible for design and development of many of the Army's major



Robert W. Vogel



Dr. Jean P. Picard



H. William Painter

conventional weapon systems, including artillery and mortar ammunition, missile warheads and power plants, jatos, grenades, bombs, mines, tank gun ammunition, and a variety of electro-explosive devices. The division has an annual budget of more than \$25 million and employs 7,000.

During the 10 years he has worked at Picatinny, Mr. Vogel has won many honors, including a commendation from the Chief of Ordnance for participation in development of the BAT recoilless system. He also was cited by the Commanding General of the Ordnance Special Weapons-Ammunition Command for directing the United Kingdom fuze modification program.

Credited with being instrumental in standardization of at least 30 Ordnance items, Mr. Vogel has approved publication of some 350 technical reports prepared by personnel under his supervision. He obtained his B.S. degree in mechanical engineering from the Newark College of Engineering and did his graduate work in management engineering at Stevens Institute of Technology.

CE Develops Pump for Bulk Fuel in Forward Areas

A pump unit incorporating a simple, highly efficient controller has been developed by the U.S. Army Corps of Engineers.

When used in a 4-inch flexible hose-line, the pump is designed to meet the Army's need for a quicker, more dependable means of transporting bulk fuel in forward areas.

The new controller reduces engine speed if suction pressure drops or if discharge pressure exceeds the desired setting. Two safety switches stop the engine if pump speed reduction is unable to maintain the pressure within the pre-set limits.

The pump is a skid-mounted unit

Professional affiliations of Mr. Vogel include the American Society of Mechanical Engineers, the Society for the Advancement of Management, the American Ordnance Association, and the NATO Standardization Group.

H. WILLIAM PAINTER is Deputy Chief of Picatinny Arsenal's Long-Range Atomic Warheads Laboratory in the Special Weapons Group. He is responsible for directing R&D activity associated with nuclear warheads.

Among Mr. Painter's functions is that of directing feasibility studies of warhead sections for proposed missile systems and the selection, in cooperation with the Atomic Energy Commission, of the optimum warhead concept consistent with total system requirements. This calls for applied research in nuclear effects on aircraft and missile structures and warheads, and effectiveness studies.

Mr. Painter earned B.A. and B.S. degrees in mechanical engineering from the Newark College of Engineering and pursued graduate studies in applied mechanics at Stevens Institute of Technology.

with built-in carrying tubes for transportability by eight men. Powered by an air-cooled engine, the pump operates at 2,800 r.p.m. with a capacity of 225 g.p.m. and a pressure head of 350 feet. The single-stage pump eliminates the need for a hydraulic connector between the two impellers, thereby reducing length and weight.

Tests have shown that the pump unit is dependable for at least 500 hours of field service without a major overhaul. It was built by the J. C. Carter Co., Costa Mesa, Calif., and the Santa Fe Manufacturing Corp., New York City, under contract with the U.S. Army Engineer Research and Development Laboratories.

AOMC Claims Only Woman Missiles Project Engineer

The only woman project engineer for an Army missile program, and probably for any missile program in this country, works as Deputy Chief of the Instrumentation Branch, Office of the Deputy CG for Ballistic Missiles, Redstone Arsenal, Ala.

Mrs. Novella Billions runs a program that obtains high-altitude atmospheric information to aid in the Army's Pershing ballistic missile test program at Cape Canaveral.

Five-foot-long sounding rockets are fired before and after each Pershing test to gather important upper air data. Wind data comes from radar tracking; density readings are transmitted from an instrument package parachuted to earth after it is ejected from the rocket.

Although Mrs. Billions does not push the button to fire the rocket, she has assisted in instrument package checkout and operation of tracking equipment during a test. She provides other research branches of ABMA with high-altitude information that aids in the design of new

Army missiles. No newcomer to the missile business, she has been in it since 1954.

She has since participated in all the Army's missile firing test programs at Cape Canaveral—Redstone, Jupiter and now the Pershing.

"Our first firings were in support of the Redstone and Jupiter missile programs in 1958," she recalled. "At that time no one knew for sure what atmospheric conditions we would find upstairs."

The names of the sounding rockets she uses include the Arcas, Loki and Deacon-Arrow. The rockets are launched by a 4-man crew from a beachside pad at Canaveral.

"Each launch has a dual purpose," she explained. "In addition to providing data for our tests, we test new instrumentation developed by the Army Signal Corps."

A native of Huntsville, Ala., Mrs. Billions holds a degree in mathematics from Athens (Ala.) College. Her first experience in meteorology came in 1950 during service in the Air Force.



Mrs. Novella Billions

"I started out to be a certified public accountant when I left the Air Force," she said. "But then I came to work at Redstone Arsenal and they told me they could use my meteorological experience."

Gerhard Reisig, Director of ABMA's Research Laboratory, paid tribute to her technical skill, saying:

"Mrs. Billions with her knowledge of in-flight data evaluation and atmospheric physics came along just when we were looking for someone to fill the job. She inherited it."

Watervliet Arsenal Gets Recognition for Process

Watervliet Arsenal's development of a new method of applying the "autofrettage" principle to strengthen gun tubes is featured in the national publication of the Society for Experimental Stress Analysis.

The February issue of *Experimental Mechanics* carries an article prepared by members of the Arsenal's Industrial Processes Branch, which developed the "swaging" method.

The usual autofrettage ("cold working") method applies hydraulic pressure within the tube, plastically deforming the tube wall to produce favorable residual-stress patterns which increase the tube strength.

In swaging, an oversize sliding cone (mandrel) forced through the tube produces the favorable residual-stress patterns but requires greatly reduced pressures. Swaging also eliminates problems encountered in the use of the press and restraining containers employed in the conventional hydraulic method.

The article was first presented as a paper at a recent national meeting of the SESA at Indianapolis, Ind. It was prepared by Thomas E. Davidson, Chief of the Metal Working Section, and project engineers David P. Kendall, A. N. Reiner and C. F. Barton, formerly an Arsenal consultant and now at Brigham Young University, Provo, Utah.

Picatinny Using Hydrosark Metal-Shaping Process

A hydrosark forming method that literally hammers metal into shape under water with one giant blow has been designed by Picatinny Arsenal engineers at Dover, N.J.

Designed to manufacture odd-shaped metal items for ammunition and missile warheads, the process

harnesses tremendous pressures from an underwater explosion, generated by an electrical spark, to wrap a piece of sheet metal around a die.

Many metals that are difficult to shape by the usual methods can be formed easily. Results are consistent since the electrical power is controlled, the system engineers said.

For protection of the operators, the process is performed within a 10-foot-high aluminum enclosure. To ensure maximum safety, high voltage components and wiring are housed in a separate compartment atop the room.

The form and the metal that will be shaped around it are placed inside the chamber and immersed in distilled water together with an electrode. Outside the barricade, an adjustable power source selects, stores and discharges the right amount of electricity, often as much as 30,000 volts.

Costly machining operations on the 105 mm. chemical shell have been substantially reduced by using the hydrosark forming facility. For example, a groove was machined into the shell body with the 5/16-inch aluminum alloy casing; the aluminum alloy casing was then blasted into the groove by water pressure in 40 millionths of a second.

Officials report the results to date indicate better products at lower cost through use of the hydrosark method.



Robert M. Michael, Picatinny engineer, pours water into hollow nose of 105 mm. shell in preparation for the hydrosark metal-forming process.

CmlC Aerobiology Research Geared to Public Health

By William S. Miller

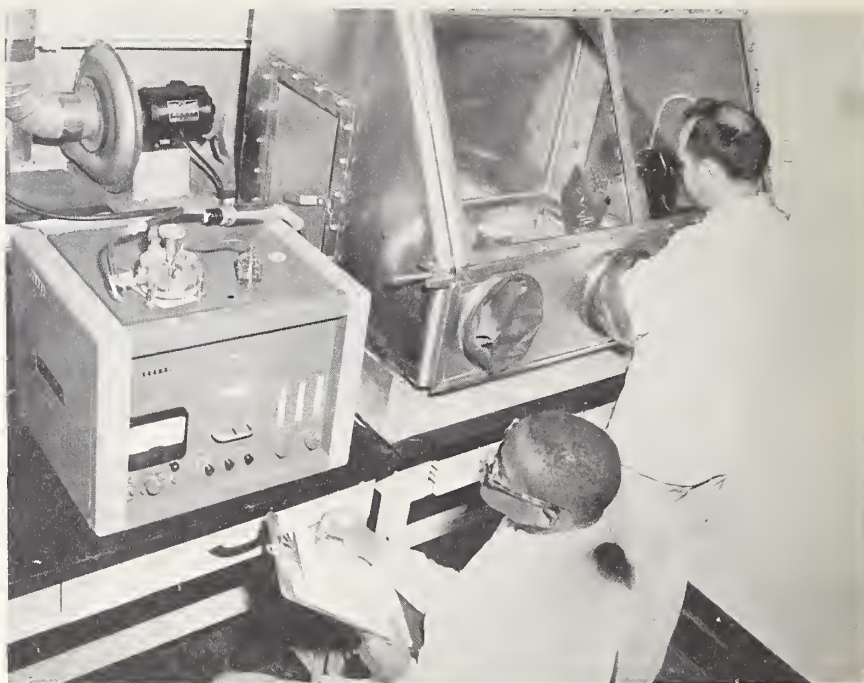
Chief, Test Chamber Branch, TED
USA CmlC Biological Laboratories

Research in aerobiology has expanded tremendously in recent years because of the recognition that inhalation of infectious particles is one of the most common means of natural infections in man. Better understanding of aerosols is needed to permit evaluation and control of airborne microorganisms in the interest of public health.

Aerosol studies at the U.S. Army Chemical Corps Biological Laboratories at Fort Detrick, Md., have led to an understanding of some of the factors affecting viability of airborne organisms, of procedures for disinfecting air, and of pathogenic organisms in terms of the numbers of cells which will initiate infection.

Many of the studies are conducted in cloud chambers where an aerosol can be created and samples taken periodically while under experimental treatment. One parameter of primary interest is the rate at which the organisms in the aerosol lose viability as, for example, in a study of atmospheric disinfectants. This parameter is termed biological decay rate and it is in this determination that radiological methods have been of benefit.

The procedures have found application to date with a number of organisms of various sizes. These constitute a shelf supply to be drawn according to the size of bacteria under study. Storage stability of the



Technicians determine the viable count in an aerosol sample (right) and the radioactive count at U.S. Army Chemical Corps Biological Laboratories.

tagged cells is excellent so that the primary loss of usefulness is due to natural decay of the radioactivity.

For example, the half-life of P^{32} is about 16 days. While there are many radioactive isotopes that have half-lives in months or years, they would present problems in disposal. The choice of P^{32} is a compromise between a long-activity life for the

tagged cells and a short-activity life for ease of disposal.

In aerosol studies with viruses, an entirely different picture is presented. These particles are considerably smaller than bacteria and therefore may be found in aerosol droplets of the smallest size. It is adequate in these tests to add a mass tracer to a virus suspension. Experiments indicate that recovery of isotopes generally is not from particles too small to contain virus.

If one estimates the number of live organisms in an aerosol at two cloud ages, the loss with time is readily converted to a decay rate. The loss, however, is not due to cell death alone but also to losses of cells impinged on chamber walls or fan blades and to losses through normal settling onto the floor. The decay rate in this case is, therefore, a total decay rate which contains physical and biological components. If the physical component can be estimated, however, it can be subtracted from the total decay rate to yield biological loss with time.

Inert mass tracers of various types have been incorporated into aerosols but these may lead to biased results. For example, dyes are found to be dispersed throughout all particle sizes, including those too small to contain organisms. This results in a physical evaluation of the total

ABRL Director Elected Fellow in N.Y. Academy of Sciences

In recognition of his "achievements in science," Dr. Riley D. Housewright, Scientific Director, U.S. Army Biological Research Laboratories, Fort Detrick, Md., recently was unanimously elected a Fellow of the New York Academy of Sciences.

In a letter accompanying the award, Academy Executive Director Eunice Thomas Miner stated in part: "Election to Fellowship is a distinguished honor, conferred on a limited number of members who, in the estimation of the Council, have done outstanding work toward the advancement of science."

Dr. Housewright earned his Ph.D. degree from the University of Chicago. He joined the staff at Fort Detrick in 1943 as a Medical Consultant with the War Research Service, Federal Security Agency. He was assigned to Fort Detrick during his

tour with the U.S. Navy and remained there as a Civil Service employee.



Dr. Riley D. Housewright

aerosol rather than that part containing microorganisms.

Radiology has given us a tool with which to measure, rapidly and accurately, the physical decay rate of cells being tested. The technique assures that the data is truly representative of the viable organisms under study. A fraction of the suspension to be tested consists of dead cells tagged intracellularly with radioactive isotopes. The radiation from these cells is proportional to the number present. Assessment of aerosol radiation at several cloud ages therefore leads to a rate of loss estimate of cells without including the influence of viability loss.

The use of radiological techniques is not new in the bacteriological laboratory. Isotopes have long been employed in metabolism studies to trace nutritional elements to their ultimate destination in cellular molecules. In genetic studies, bacteria have been exposed to radiation in low doses to induce mutations. Methods of sterilization have been developed which employ radiation for complete deactivation of organisms, as in foods.

The metabolism techniques provided the means for placing isotopes within the cells. Bacteria are normally grown on a medium containing food constituents essential to reproduction and growth. One of these constituents is rigged, however, with a radioactive element such as P^{32} in such concentration that radiation has no immediate effect on the cells. The medium is seeded with the type cells of interest and they soon begin the multiplication process without regard to the unnatural food component. Following absorption into the cell, normal metabolism occurs and the isotope becomes an integral part of the bacterial structure.

When sufficient numbers of tagged cells have been grown they are harvested, killed with disinfectant and washed to remove extra-cellular isotopes and residual disinfectant. Killing results in a stable, nonreproducing cell structure unaffected by factors which reduce bacterial viability.

The tagged cells are added to the suspension of viable organisms to be tested and mixed to insure a homogeneous distribution. The suspension is then disseminated and the resulting aerosol subjected to the desired experimental treatment.

Assessment of mixed aerosol samples is relatively simple. A fraction is employed for determining viable cell numbers by standard bacteriological procedures. The remaining sample is then assessed for radioactivity with any of a variety of instruments, including Geiger Muller tubes or flow counters.

AMRC Plans Symposium on Nonlinear Problems

The U.S. Army Mathematics Research Center will sponsor its first symposium on nonlinear problems Apr. 30-May 1-2. Approximately 150 researchers in this field are expected to attend the 3-day session at the University of Wisconsin in Madison.

Renowned mathematicians from England, Germany and leading educational institutions in the United States have been invited to present papers. A session for contributed papers also is scheduled. Participants will discuss methods they have invented, adapted, or found effective, and will suggest areas of promising research.

Among those invited to present papers are: Helmut H. Schaefer, Mathematical Institute of Tübingen, Germany, presently on the University of Michigan staff; Dr. Mary L. Cartwright, Cambridge University, Cambridge, England; Louis Nirenberg and Peter D. Lax, Institute of Mathematical Sciences, New York University; Philip Hartman, Johns Hopkins University; E. H. Rothe and Charles L. Dolph, University of Michigan; David Gilbarg and Robert Finn, Stanford University; James B. Serrin,

University of Minnesota.

A physical system is said to be linear if inputs which separately produce certain outputs will together produce an output equal to the sum of these individual outputs. Powerful mathematical methods exist for analyzing such systems. Nonlinear theory is not as highly developed, and solutions to certain problems are presently attainable only by approximations obtained by electronic computers.

2 Watertown Men Win Awards

Technical papers presented at the 64th Annual Meeting of the American Society for Testing Materials earned Norbert H. Fahey and Charles F. Hickey, Jr., of the Watertown Arsenal Laboratories, "Special Act" cash awards of \$200 and \$175, respectively.

Mr. Fahey's paper, "Effects of Variables in Charpy Impact Testing," has been selected for publication in *Materials Research and Standards* magazine. Mr. Hickey's paper, "Tensile Strength-Hardness Correlation for Titanium Alloys" will be published in the *American Society for Testing Materials Procedures*.

Journal Cites CmLC Scientist for Research Paper

An article by Dr. LeRoy D. Fothergill, Scientific Adviser to the Chief Chemical Officer, Fort Detrick, Md., has been singled out as one of the outstanding papers published in the *New England Journal* since it was founded 150 years ago.

The Journal cited the Fothergill article, based on his work in the vital biological research of encephalitis, in its Jan. 4, 1962 issue.

During an epidemic of encephalitis among horses in Massachusetts in 1938, infants and children with a similar syndrome were observed. Dr. Fothergill and his associates isolated the virus from a patient with fatal encephalitis. The virus, identified from

the brain tissue, appeared to be identical with the Eastern variety of equine encephalomyelitis.

As the first instance of the isolation of the virus from a human being, findings offered the first proof that this disease could be transmitted to man. The Journal considers this work to be of sufficient importance to be included in bibliographic listings to illustrate the progress of medicine.

Dr. Fothergill received his M.D. degree, cum laude, from Harvard Medical School in 1929 and served his internship at Children's Hospital in Boston. From 1930 to 1941, he was an instructor in bacteriology, immunology, and pediatrics at Harvard Medical School. Called to active duty as a lieutenant commander in 1941, he organized and directed the Department of Epidemiology at the Naval Medical School, and also supervised the research work in epidemiology.

Employed at Fort Detrick in 1943 as Chief of Defensive Division, he supervised all the defensive aspects of the biological weapons system. In May 1944 he became Technical Director, Special Projects Division, Chemical Warfare Service (now designated Chemical Corps), advanced to Assistant Director of the Biological Laboratories in 1946, and served as Director from November 1952 to October 1953, when he became Technical Director.



Dr. LeRoy D. Fothergill

SC Develops Radio-Sounding Technique for Measuring Glaciers

A radio-sounding technique being developed by scientists and engineers of the U.S. Army Signal Corps to plumb polar ice has been successfully used to measure the depth of a massive glacier in the far-north region of Canada.

Soundings were made recently on Brae Glacier, which creeps outward from the central icecap on Devon Island, some 20 miles south of Ellsmere Island.

Although the Signal Corps method had been used successfully to measure the depth of relatively stable icecaps, it had not been employed before on glaciers. Because of their more appreciable movement, which causes fractures and builds up various types of rocky moraines, it had been conjectured that radio signals might be deflected and thereby upset readings. However, no serious disruptions were observed during the measurements on Brae Glacier.

Radio sounding to plumb the ice which covers much of the Arctic and Antarctic was pioneered by Amory H. Waite, Jr., a veteran engineer-explorer employed by the U.S. Army Signal Research and Development Laboratory, Fort Monmouth, N.J. Employed in the Laboratory's Institute for Exploratory Research, he recently was given an Army Research and Development Achievement Award for the accomplishment.

The method entails measuring the fraction of a second it takes for radio signals to penetrate icy depths and return to a receiver after reflecting off the underlying soil, rock or water. The velocity through ice is about half

the 186,000 miles per second at which radio waves travel through the atmosphere.

Army technicians familiar with the radio sounding of ice believe the method offers definite advantages in many instances over the equally accurate though highly laborious seismic soundings now widely made. In seismic soundings, explosives are set off on the surface, the sound waves picked up from the bottom by interlinked microphones, and the results analyzed. The process is expensive, time-consuming, and requires highly skilled seismologists. On the other hand, radio soundings can be made quickly with relatively simple equipment by operators who require little special training.

The speed of the new method is said to make it especially promising for obtaining a better picture of the geographical features hidden by the ice in vast stretches of the Antarctic.

Following earlier sounding experiments in the Arctic and Antarctic, Mr. Waite and two associates from the Army Signal Laboratory, Dr. Gernot M. R. Winkler and Stanley J. Schmidt, flew last July to Tuto East, Greenland, the Army research base near Thule.

Essential equipment for last summer's program included a modified radio altimeter, operating at 440 megacycles, and special transmitting and receiving antennas mounted on 4-foot-square sheets of aluminum, all carried on a tractor-drawn sled. Soundings were made 60 miles from the coast at depths ranging down to 2,000 feet—the approximate limit of the 7-watt equipment.



Amory H. Waite, Jr., famed engineer-explorer, points out rocky promontory on Burke Island named in his honor.

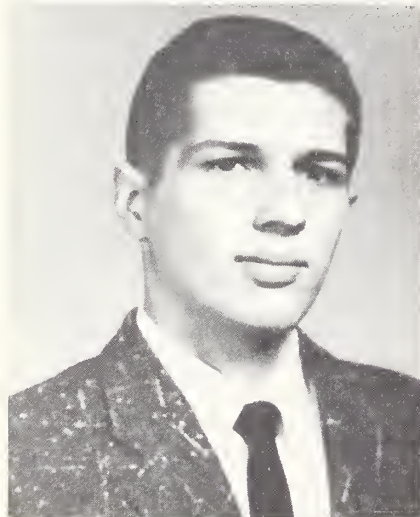
Meantime, a Canadian-U.S. scientific party had established three camps on Devon Island to carry out some of the phases of a broad study on Arctic climatology, under the auspices of the Arctic Institute of North America and the U.S. National Science Foundation.

One specific task of the Devon party was to measure the rate of movement and decay of glaciers. Robert S. Appollonio, a glaciologist with the NSF, made arrangements for the Signal Corps party to attempt the soundings on Brae Glacier. Mr. Waite, Dr. Winkler and Mr. Schmidt were taken from Greenland to Devon by the U.S. Coast Guard cutter *Westwind*.

Because of underwater navigation hazards, the ship lay about eight miles offshore from the point where Brae Glacier breaks off into the sea. Dr. Winkler and Mr. Schmidt were ferried back and forth to Devon in a Navy helicopter piloted by Lt Charles Martin of the U.S. Naval Air Station at Lakehurst, N.J. Mr. Waite coordinated operations from the ship.

The helicopter made six landings on the glacier for soundings at points three to four miles inland. The recorded depth readings ranged from about 250 to 700 feet.

New soundings with improved equipment and a wider range of frequencies are being carried out in the Antarctic by Mr. Waite and Mr. Schmidt. They left via plane Oct. 18 to join the U.S.S. *Glacier* at New



Stanley J. Schmidt



Dr. Gernot M. R. Winkler

Zealand for a 5-month trip during which they are making varied over-ice radio propagation studies for the Army. (The trip is Mr. Waite's ninth to the South Polar region, and the first for Mr. Schmidt, who has gone to the Arctic three times for the Signal Laboratory.)

The National Science Foundation has specifically requested more data on the radio sounding of ice and has made base facilities available at McMurdo Sound and Roosevelt Island.

The two men plan to make most of their measurements from a helicop-

ter flying about 200 feet above the surface. They hope to survey, among other regions, some 100,000 square miles in the Sulzburger Bay area.

Making soundings from helicopters requires somewhat more elaborate techniques than those used for measurements at the surface.

Plans call for using a barometric pressure altimeter to give absolute height above sea level. A 110-megacycle transmission is expected to provide especially good penetration of the ice. In turn, a standard 4,300-megacycle radar altimeter is expected

to provide the most reliable surface reflection. The three sets of figures so obtained will then be compared to provide a surface profile and the depth of the ice itself.

By using the new 110-megacycle equipment, the Signal Laboratory engineers believe they can obtain soundings down to 5,000 feet. They hope eventually to penetrate the nearly two miles of ice which covers some parts of the Antarctic, and is nearly as thick in Greenland, by using greater power, more sensitive receivers, and lower frequencies.

Radio Sounding Tests May Explain Polar Aircraft Crashes

An explanation for many aircraft crashes in polar regions or mountain areas encrusted by deep glaciers is advanced in findings reported in a recent message from Antarctica on U.S. Army Signal Corps radio sounding tests.

Potentially of far-reaching significance was the concluding statement of the Jan. 29 wireless message that: "The above emphasizes the danger in using any radar altimeters below 4,000 to 5,000 megacycles over thick ice."

Test results indicated possibility of errors of 1,100 feet or more in aircraft altimeter readings in passage over polar icefields. Flying under the dreaded Arctic "whiteout" or poor visibility conditions, a pilot thus could be deceived into a crash.

Similarly significant, in the opinion of Dr. Paul A. Siple, U.S. Army Research Office Scientific Adviser, was the finding that radio sounding of polar regions from aircraft is as reliably accurate as the slow and laborious method of seismic recording *when ice and snow cover is not deeper than 1,100 feet. Deeper ice still calls for seismic methods.*

Using the new Army Signal Corps radio sounding technique and helicopters or other aircraft peculiarly adapted to the rugged polar terrain, Dr. Siple said it now appears feasible to establish sub-ice formation contours in minutes when seismic recordings might require months.

Revolutionary as the radio sounding technique is now considered, Dr. Siple is hopeful that it is but a major advance along a research trail that someday may lead to "radio photographic" techniques of establishing contours of polar deep snow and ice formations. He has carried this hope since he first suggested the possibility to Amory H. Waite, Jr., when the U.S. Army was planning for participation in the International Geophysical Year research in polar areas.

Mr. Waite, whose technique of radio sounding of polar ice is described in detail in an article on page 14, reported on his latest findings in the Jan. 29 message, as follows:

"Forty-nine helicopter flights McMurdo, Ross Island, Bay of Whales, Kainan Bay and nearby areas made by Waite and Schmidt, U.S. Army Signal Research and Development Laboratory engineers, with excellent cooperation [from] Commanding Officer and staff of USS *Glacier* and pilots Burke, Kizer, Hummel and Przybyszewski, HU-1, Lakehurst Naval Air Station, with 440-megacycle radio ice depth sounding equipment. Highly successful. Results agree adequately with previous seismic soundings in ice up to 1,100 feet thick, both floating and aground.

"*For example: (Item 1)* seven-minute flight AST Cape Crozier proved ice is floating from Knob Head eastward, increases height from 35 to 50 feet in 5-mile distance and thickness from 220 to 330 feet.

"*(Item 2)* Three-minute flight Little America V to Camp Coldbottom and highest point east of Cape Kainan Bay at 600 feet altitude and 70-knots speed produced depth 256 meters to compare with Crary's 254 meters at Little America V or 840 feet to agree exactly with SIPRE (now redesignated the Cold Regions Research and Engineering Laboratory) drilling of 840 feet, 248 meters for Crary's 248 meters at Camp Coldbottom, and 209 meters or six feet less than Crary's 1957 soundings of 211 meters at East Camp.

"*(Item 3)* Fifty-seven minute flight from southern apex Bay of Whales to Point 29 miles inland over Roosevelt Island, thence two miles eastward and return 23 miles to Little America I. Steel towers show 54 miles excellent readings still being analyzed but apparently agreeing with many of Poulter's 1934 measurements within few feet and indicating

open crevasses as helicopter flew at altitudes to 2,000 feet. Proceeding eastward along the Marie Byrd Land coast under command of Capt Edwin A. McDonald, Deputy Commander, Navy Support Forces, Antarctica, making surveys as requested.

"System adequate for use anywhere on thick floating ice when maintained by average technicians and operated by enlisted personnel with few weeks training. Both surface and ice [thickness] obtained with same radio sounding equipment but surface contours still rely on barometric and 4,300 megacycle altimeters which have proved difficult to maintain.

"Further testing of 110 megacycle sounding equipment planned when near thick ice but two trials unsatisfactory to date due to equipment defect, not principle. The above emphasizes danger in using any radar altimeters below 4,000 or 5,000 megacycles over thick ice."

Discrimination Radars Set Up For Nike Zeus Missile System

A discrimination radar designed to collect data for the Army's Nike Zeus antimissile missile system is being installed at White Sands Missile Range, N. Mex.

One of several radars planned for use in the Nike Zeus system to gather data fed to electronic brains to direct Nike Zeus missiles to their targets, the discrimination radar will be used for extensive development testing. Its function is to distinguish ballistic missile warheads from accompanying decoy devices the enemy may use to confuse the defense.

Emplacement of a similar unit at the Kwajalein Island Zeus test site in the South Pacific is well advanced. In coming months the complete missile defense system will be tested, using target nose cones launched by intercontinental ballistic missile boosters fired west from California down the Pacific Missile Range.

ABC Standardization Program Unites 3 Armies

By Lt Col Kenneth G. Groom

Differences in weapons, ammunition, field equipment, procedures and doctrine often hindered battlefield performance when the United States, British and Canadian armies fought side by side in World War II. Through the American - British - Canadian (ABC) Standardization Program, the three armies are resolving differences and enhancing ability to fight together effectively in any future war.

Standardization of materiel and nonmateriel items has progressed notably through this program during the past 15 years. Effort is directed toward the greatest possible economy for armies of the governments concerned through use of combined technological and scientific resources.

Exchange of information among the ABC allies includes sharing of procedures governing tactical doctrine, organization, intelligence, operations, administration, logistics, research and development, and the design of weapons and equipment in which there is a common interest.

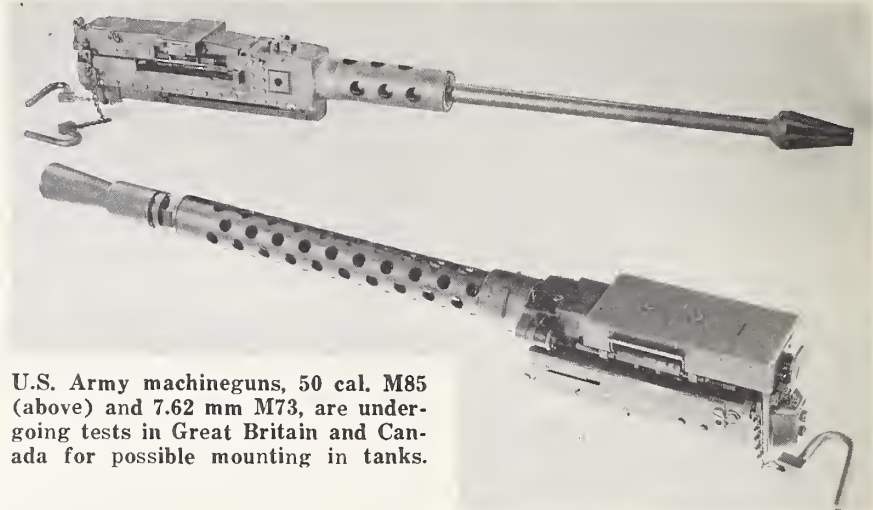
The broad aim of standardization is to ensure that there will be no operational, materiel or technical obstacles to full cooperation and collaboration among the American, British and Canadian armies to achieve the greatest benefits at lowest practicable cost.

Collaboration in research is directed toward solution of mutual problems by pooling knowledge and combining talents of top-ranking scientists in each of the member nations.

None of the ABC armies is legally compelled to agree to a standard or to join in collaboration and coordination leading to a possible standard.



Standardized, vehicular-mounted mine detector can be mounted on vehicles of all three ABC Program countries.



U.S. Army machineguns, 50 cal. M85 (above) and 7.62 mm M73, are undergoing tests in Great Britain and Canada for possible mounting in tanks.

Once an army has approved a standard, however, it is morally obligated to conform unless released by agreement of the other armies, or unless the standard item is replaced by a new development. Insofar as manufacturing techniques permit, ABC materiel and nonmateriel items will be identical. As a minimum, items of equipment will have interchangeable parts and assemblies.

For example, if current effort is successful, the Tripartite 81 mm. mortar will satisfy a mutual requirement. It will have a British tube and bipod, a Canadian baseplate and sight, and U.S. fuzing for the ammunition.

An example of "partial" standardization is the development of the 7.62 mm. rifle cartridge, for use in different weapons of the three armies. It was adopted by the NATO countries under the Mutual Weapons Development Program (MWDP).

The U.S. Army standard machinegun, M60, which fires the NATO 7.62 mm. cartridge, is undergoing tests in Britain and Canada and may be adopted as standard by these two countries. (See January issue, page 12, for illustration of M60.)

In the materiel field, there are now over 100 active, formalized ABC Army Standards and 40 more in the process of completion. In addition, as of Dec. 31, 1961, there were over 180 specific agreements which do not require publication of a formal ABC Army Standard.

The standards list includes items ranging from spark plugs to vehicles, telephone cable to radio sets, trucks to aircraft, pistol ammunition to medium gun shells, and rifles to missiles. The photographs shown here illustrate a few of the materiel items which have been standardized by the

three armies or are under consideration for standardization.

In the nonmateriel field, approximately 100 active procedures and studies have been approved for standardization. The procedures include such diversified items as operation orders, techniques for minefield laying and recording, adjustment of artillery fire, relief of combat troops, and military mapping. In standardization parlance those are called SOLOGs, an acronym used to describe operational and logistical areas.

Standardization of both materiel and nonmateriel items requires agreement on the need for standardization and application of the principle of reciprocity. The reciprocity concept among the three armies extends to funding and to the exchange of personnel, materiel, information, visits and joint use of facilities. The principle covers, for example, the loan of equipment by one army to another for test and evaluation, on a nonreimbursable basis, even though the materiel loaned may be destroyed in tests.

Perhaps the keystone of the ABC program is the principle that a full exchange of information and opinion

Lt Col Kenneth G. Groom is Chief of the Standardization Branch, International Division, OCRD. His 20-year military career has included assignments as Tank Destroyer Company Commander with the 36th Inf Div in Europe, Commander of Gen MacArthur's Honor Guard in Tokyo, Weapons Instructor at Fort Benning and Battalion Commander, 27th Inf "Wolfhounds." An Infantry officer, he served for a year as Secretary Joint Staff, United Nations Command Korea prior to joining OCRD in 1961.

among the armies is effected with a minimum of formal procedure. Within the limits of national policies, information on the status of all development projects, current doctrine and tactical concepts is made available.

Consequently, a great volume of information is moving continuously among the armies, on a variety of subjects. Standardization would be virtually impossible without this exchange. Of course, each army has agreed to safeguard classified information received from the others in a manner comparable to that found in the originating army.

Differences over standardization or collaboration are referred to higher levels for resolution as early as possible. Differences do arise on occasion, but the ABC agreement provides a suitable channel for mediation.

In the interests of economy, each army has agreed that it will make maximum use of existing agencies and procedures. The possibility of sharing the work of research and development is under constant review.

The ABC Standardization Program is administered by the Washington Standardization Offices (WSO) headed by Maj Gen Dwight E. Beach, Deputy Chief of Research and Development, U.S. Army, and the Commanders of the British and Canadian Army Staffs in Washington, D.C.

The WSO is assisted by the Primary Standardization Office (PSO). Col David G. Gauvreau, Chief, International Division, OCRD, is the U.S. member of the PSO. The British and Canadian members, Col Thomas S. Foster and Lt Col John S. Ussher, respectively, are liaison officers in the International Division, OCRD.

The PSO works on a full-time basis to monitor activities of the Standardization Committees. It makes arrangements for WSO meetings, reviews progress, recommends action to the WSO, records mutual arrangements, and informs the WSO of any difference between the armies.

The permanent Tripartite Standardization Committees, consisting of U.S., United Kingdom and Canadian members, meet about every six weeks to establish, maintain and review lists of all projects. The committees activate and assign materiel and nonmateriel projects to armies for monitoring, foster collaboration, monitor standardization requirements, publish Army Standards, coordinate all ABC Army standardization matters, and recommend formation of working groups when required.

Seven of the committees are involved in the standardization of end

items of materiel. Their names correspond to the U.S. Army Technical Service with which they are involved, namely: Ordnance, Signal, Engineer, Chemical, Transportation, Medical and Quartermaster. Others are the Research Coordination Committee, the Technical Procedures Committee, and the Nonmateriel Committee.

The Tripartite Research Coordination Committee (TRCC), as its name implies, is responsible for coordination of research among the armies. It was founded under the direction of the WSO in 1953, and organized under the Basic Standardization Agreement among the ABC armies. The TRCC consists of one member and one alternate from each army.

Dr. Richard A. Weiss, Deputy and Scientific Director of Army Research is the Army member of the TRCC and Dr. Leonard S. Wilson, Chief of the Earth Sciences Division, U.S. Army Research Office, is alternate.

Major areas of research coordination of the TRCC include: human resources, operations, arctic environment, offroad ground mobility, infrared and ultraviolet, combat surveillance, mapping and medical services.

The Technical Procedures Committee is responsible for coordinating standardization in the field of technical and industrial procedures such as measurement standards, design practices and component repair parts.

The Nonmateriel Committee coordinates standardization matters dealing with doctrine and procedures, leading to publication of SOLOGs.

Liaison arrangements among the three countries are designed to effect close coordination and unity of effort. On the U.S. Army side, there are two standardization groups, each under the operational and administrative control of the U.S. Army Chief of Research and Development. The

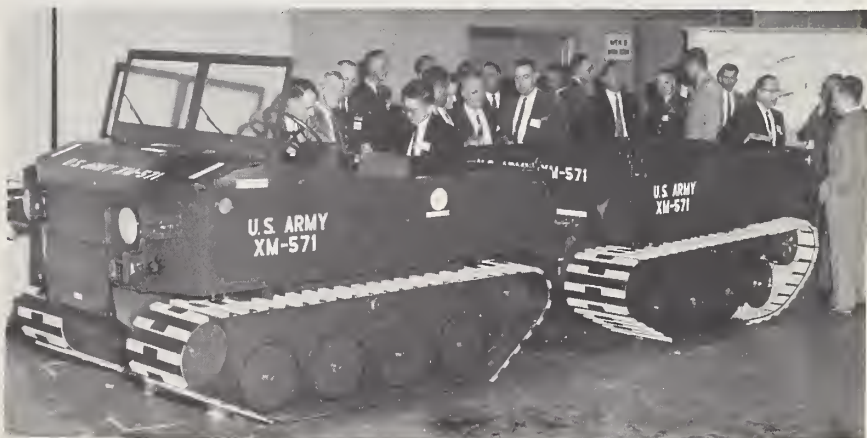
group in London maintains liaison with the British War Office, Ministry of Aviation, and various UK Army field agencies; it also handles NATO and Mutual Weapons Development Program standardization matters. The group in Ottawa provides U.S. Army representation at Army Headquarters, the Defense Research Board and other Canadian Army field agencies. Each group consists of highly qualified members of the U.S. Army Technical Services and the combat arms.

The Tripartite Ad Hoc Working Group on Priority Standardization Effort met in Washington last November and attained results termed "most gratifying." This high-level group gave added impetus to the ABC Program and reached prompt agreement in fostering increased collaboration in research and development. Shortly thereafter, their recommendations were all approved by the three countries with very slight modification in one or two instances. Implementation of these recommendations should result in tripartite standardization of a number of major items.

An important offshoot of the ABC Program is the U.S. Army-Canadian Development Sharing Program. Under provisions of Army Regulation 1-25, procedures have been set up whereby: (1) qualified Canadian industry may competitively bid on contracts for U.S. Army development projects; (2) the U.S. Army participates in projects which have their inception in Canada; and (3) the U.S. Army may nominate projects which, if acceptable to Canada, may be developed there, utilizing Canadian funds and facilities.

Much of the activity in the U.S. Army-Canadian Development Sharing Program has been in the third category, wherein Canada develops items

(See page 18, column 3)



Full-track utility carrier, XM-571, on display, is being developed by Canada to meet a U.S. Army requirement under ABC Standardization Program.



British and Canadian members of the Washington Standardization Office (WSO), Maj Gen J. M. McNeill, Chief, British Army Staff (left) and Brig J. A. Bennett, Chief, Canadian Army Staff, flank Mrs. Arthur G. Trudeau at recent American British and Canadian reception. Standing are Maj Gen Dwight E. Beach, WSO member and Deputy Chief of Army Research and Development; and Army Chief of R&D, Gen Arthur G. Trudeau.

Top Officials Take Part in Annual ABC Reception

Approximately 200 American-British-Canadian Army Standardization Program officers, high ranking officials of the Department of Defense, and their ladies attended the annual ABC reception Feb. 21 at the Fort Meyer (Va.) Officers Club.

Lt Gen and Mrs. Arthur G. Trudeau were hosts at the colorful affair. As Chief of Research and Development, General Trudeau is responsible for the U.S. Army contribution to the ABC Standardization Program.

Among notables in attendance were Assistant Secretary of Defense for International Security Affairs Paul H. Nitze, Assistant Secretary of the Army (R&D) Dr. Finn J. Larsen, Assistant Secretary of the Army (Installations and Logistics) Paul R. Ignatius, Assistant Secretary of the Army (Financial Management) W. F. Schaub, and Army Chief of Staff General George H. Decker.

Other dignitaries included the Commanding Generals of the Technical Services and several members of the Army Scientific Advisory Panel.

CmIC Awards Total \$2,575 for Employee Performance

Certificates and cash awards totaling \$2,575 for sustained superior performance, inventions, special act or service, and a beneficial suggestion, were presented recently to 26 men and women at U.S. Army Chemical Research & Development Laboratories.

For sustained superior performance: Pearlina E. Carter, Hermoine R. Horsey, Ann N. Moore, David Johnson, \$100 each; Rose Marie Figueroa, Lucille K. Hamby, Vera M. Keithley, Mary C. Mannion, Mary S. Snyder, Asby B. Miller, \$150 each;

Thomas A. Ballard, John N. Carter, Jr., and James O. Ebaugh, \$200 each; and Stuart M. Jessop, \$250.

Patent awards and cash for inventions went to Hugh R. Carlon, Harvey Tannenbaum, Kenneth G. Carlon, Woodrow W. Reaves, Charlie H. Davidson, and Franklin Owens, \$25 each; Frank Schouten and Robert B. Wheeler, \$50 each; John L. Kratzer and Sidney Rothbert, \$100 each.

Margaret H. Oakley received \$25 for a special act or service, and \$25 for a suggestion to James J. Buckner.

WSMR Passes 50 Percent Of Invention Proposals

Fifty percent of inventions submitted in 1961 by White Sands Missile Range (N. Mex.) personnel for primary evaluation were adjudged worthy of patent application.

The WSMR Patent Office decided that 11 of 20 invention proposals contained sufficient Ordnance utility to qualify for patent applications. The applications were forwarded to higher headquarters and eventual transmission to the United States' Patent Office. Six White Sands civilian employees were awarded \$50 each in 1961 for having their patent applications filed at the U.S. Patent Office.

Frank J. McKenna, Chief of the White Sands Patent Office, said that Government personnel, both military and civilian, are urged to turn in usable invention proposals.

In accordance with this policy, the WSMR Patent Office conducted a 3-day meeting this past summer. About 350 WSMR technical personnel were briefed on patent procedures and the benefits which the Government and individuals derive from this program.

ABC Army Standardization . . .

(Continued from page 17)

to fulfill U.S. Army requirements and pays the R&D costs. Of course, by making this financial commitment, Canada has its sights on production of items which may result following a successful development. An important fringe benefit of this program is that the item eventually developed by Canada may be well suited for ABC standardization.

Over the past 15 years the ABC Army Standardization Program has matured to the point where it now provides an effective organization to achieve its aims. Meeting in Washington recently, the WSO issued the following statement:

"It has become increasingly evident in recent years that a better correlation of R&D programs of the ABC countries will ease the load on all countries. . . . It is sincerely hoped that all three countries will fully appreciate that the success of the ABC Program is largely dependent on early cooperation on new projects so that parallel and competitive development will be held to a minimum."

In a spirit of mutual trust and cooperation, the American, British and Canadian Armies are ensuring that the problems of yesterday will not rise on the battlefield of tomorrow.

National Science Foundation Credits Army With Major Assist on Antarctic Map Project

Described as one of the most difficult and ambitious map control projects ever undertaken in the Antarctic, Topo North and South was completed in mid-January by the U.S. Geological Survey assisted by the U.S. Army and the U.S. Navy.

Made possible by a National Science Foundation grant, the survey covered nearly 100,000 square miles, approximately one-third the area of New England. Two Army turbine-powered helicopters, previously untested in the Antarctic, transported USGS engineers a total of 1,510 traverse miles.

Topo North and South was started from Plunket Point, 320 miles from the South Pole. It extended northward through the rugged chain of mountains bordering the western fringe of the Ross ice shelf and Ross Sea to Cape Roget, just north of Hallett Station.

The total stretch of approximately 1,100 miles is roughly equivalent to the distance from Washington, D.C., to the southern tip of Florida. The objective was to determine the angles and distances between points of high elevation along the traverse route.

When computed to actual elevations and positions, the recorded findings will be used with existing aerial photographs of the mountain chain to produce extremely accurate maps of 100,000 square miles of Antarctic wilderness. USGS engineers William H. Chapman, William C. Elder and Ezekiel R. Soza made the survey, using an electronic tellurometer and a theodolite.

Logistic support for Topo North

and South was provided by the Army helicopters manned and maintained by three officers and six enlisted men commanded by 1st Lt John H. Greene, U.S. Army Transportation Board. During 180 hours of flying the helicopters consumed 10,800 gallons of JP4 fuel. They are designed to attain the high altitudes necessary in transporting the survey team from one mountain peak to another.

Topo South covered the distance from Plunket Point at the head of the Beardmore Glacier to McMurdo Station. It provided ground control for mapping 60,000 square miles. Topo North, extended from McMurdo Station to Cape Roget, provided control for 37,500 square miles.

Forty-three observation sites were occupied during the 32 days of Topo South, and 25 sites were occupied during the 25 days of Topo North. Average distance between the sites was about 20 miles. Of the 57 days of the project, 22 were working days. Nonworking days were the result of inclement weather or delays caused by the difficult logistic support.

The engineers set brass geodetic tablets into the rock at 33 of the Topo South sites and at 17 of the Topo North sites. These markers are numbered so that altitude, latitude and longitude will be available for the use of future surveying parties. Highest point occupied during the projects is believed to be Mount Usher, at about 11,500 feet.

In making the survey, Soza was transported to the forward peak while Chapman and Elder occupied the rear peak. At each forward peak, Soza



Army HU-1B refuels for Topo South.

erected a wooden sighting target, set a geodetic tablet and operated the remote unit of a tellurometer (distance-measuring device).

The master unit, on the rear peak, sent out a radio signal that was received by the remote unit and bounced back to the master unit. The master unit, operated by Elder, measured the time required for the signal to span the distance twice. From this, distance was determined to an accuracy of two inches in 20 miles.

Chapman then used a theodolite to measure the angles between rear and front sites, and to peaks perpendicular to the traverse route. When this was completed, Chapman and Elder were flown to the peak just occupied by Soza. Soza was flown on to the next peak, and the whole routine repeated. Daylight stellar observations were made at both ends and in the middle of each traverse route to relate it to true position on the earth.

Continuous support along the edge of the Ross ice shelf at the base of the mountains was provided Topo South by a helicopter and a single engine Otter of the Navy's Air Development Squadron Six (VX6), flown by Lts John A. M. Hickey and Ronald L. Bolt. Topo North was assisted by two helicopter flights, four R4D Dakota flights and 13 Otter flights, all flown by VX6 pilots.

A National Science Foundation press release, datelined McMurdo Sound, Antarctica, stated:

"Completion of the project within a span of 57 days in the face of rigorous Antarctic climate is considered by the National Science Foundation representative here as an outstanding accomplishment credited to favorable weather, excellent flying by participating pilots, good logistic support and the fine performance of the Army helicopters. . . ."



Official U.S. Navy Photos

Camp site used by U.S. Geological Survey team working on Topo South.



Engineer Ezekiel Soza checks tellurometer during Topo South operations.

Defense Communications Control Center Opened

Operations at the Defense Area Communications Control Center for the continental United States commenced Feb. 1 at Fort Carson, Colo. Other centers established since the Defense Communications Agency was activated May 12, 1960, are in Hawaii, Europe and Alaska.

The Defense Communications Agency has responsibility for operational and management control over the worldwide Defense Communications System, including planning, en-

gineering, programming, and R&D.

The four DCA control centers tabulate, assemble, store and display information on current conditions of the components of the Defense Communications System to assure the greatest responsiveness to users needs.

Army Directs Clearance On All R&D Study Reports

R&D Directive No. 360-4, dated Jan. 10, 1962, requires proper coordination and clearance of all R&D study reports prior to distribution outside the Army.

The Directive's definition of study reports includes operations research and analysis studies, feasibility studies, results of materiel tests and R&D management studies.

Provisions of the Directive call for prefatory statements in all study reports, indicating views therein represent only the preparing agency and have not been approved by the Department of the Army. Distribution of controversial reports or those at variance with an established DA position will be confined to Army agencies unless dissemination is approved.

ASAP to Meet at Fort Rucker

The U.S. Army Aviation Center, Fort Rucker, Ala., will entertain the spring meeting of the Army Scientific Advisory Panel, Apr. 16-17.

In line with its recent recommendations for greater emphasis in developing aircraft suited to combat mobility requirements of a modern Army, the Panel will see a demonstration of how aircraft can aid field commanders.

AROD Officials Make Tour Of Signal Lab Facilities

Twelve officials of the Army Research Office, Durham, N.C., recently toured the U.S. Army Signal Research and Development Laboratory, Fort Monmouth, N.J., to examine facilities and be briefed on the latest scientific achievements.

AROD leaders participating in the 2-day conference included Dr. John W. Dawson, Chief Scientist; Lt Col Leslie G. Callahan; Dr. Sherwood Githens, Jr., Deputy Chief Scientist; Dr. Herman Robl, Director of the Physics Division; Dr. Marvin Silver, Head of the Solid State Physics Branch; James J. Murray, Director of the Engineering Sciences Division; Dr. George M. Wyman, Director of the Chemistry Division; Dr. Peter Kosting, Director of the Metallurgy and Ceramics Division; Dr. Alan S. Gilbraith, Director of the Mathematics Division; Dr. Donald P. Wylie, Associate Director of the Internal Research Division; and Mrs. Grace Bodie, Chief Scientific Services Div.

CE Incentive Awards Hit Peak During Past Year

Awards presented personnel at the U.S. Army Corps of Engineers' two principal research and development establishments at Fort Belvoir, Va., reached an all-time high in 1961.

A report by the Incentive Awards Committee covered awards made to personnel at the U.S. Army Engineer Research and Development Laboratories (USAERDL) and the U.S. Army Engineer Goedsy, Intelligence and Mapping Research and Development Agency (USAEGIMRADA). Cash awards in 1961 aggregated \$24,260 compared to the previous high of \$17,200 in 1959 and \$16,380 in 1960.

"Sustained Superior Performance" awards totaled 118, including 97 to USAERDL personnel and 21 to per-

sonnel of USAEGIMRADA, compared to 71 in 1960 and 73 in 1959. Cash accompanying these awards amounted to \$21,700 last year compared to \$16,380 in 1960 and \$17,200 in 1959.

Forty-one employees at USAERDL and four at USAEGIMRADA, received "Outstanding" ratings in 1961. There were 36 such awards in 1960, 31 in 1959 and 12 in 1958.

Eleven patents were granted to USAERDL personnel in 1961 and they received token awards amounting to \$900. Other USAERDL awards included three "Special Act" awards for which the recipients received \$800; three Certificates of Achievement, one Certificate of Appreciation, two R&D Achievement Awards, and one Exceptional Civilian Service Award.

SCIENTIFIC CALENDAR

Spring Instrument-Automation Conference & Exhibit, sponsored by the Instrument Society of America, Dallas, Tex., Mar. 26-29.

Reversible Photochemical Processes, Durham, N.C., March (date undetermined).
Symposium on Solar Sciences, sponsored by the Association for Applied Solar Energy, Phoenix, Ariz., April (date undetermined).

2nd Symposium on Plasma Sheath, sponsored by AFCLRL, Boston, Apr. 3-5.

Chemical Society Symposia, Sheffield, England, Apr. 3-5.

Launch Vehicles: Structures & Materials Conference, sponsored by ARS, Phoenix, Ariz., Apr. 3-5.

The High Temperature Aspects of Hypersonic Fluid Dynamics, Rhode-St Genese, Belgium, Apr. 3-6.

13th Annual Advanced Statistical Quality Control Institute, Storrs, Conn., Apr. 8-20.

International Symposium on Analytical Chemistry, sponsored by the Society for Analytical Chemistry, Birmingham, England, Apr. 9-13.

2nd International Conference on Stress Analysis, Paris, France, Apr. 10-14.

Institute of Environmental Sciences Annual Technical Meeting & Equipment Exposition, Chicago, Apr. 11-13.

2nd Conference on Kinetics, Equilibria, and Performance of High-Temperature Systems, Los Angeles, Apr. 14-16.

2nd International Symposium on Flight Test Instrumentation, Cranfield, England, Apr. 16-18.

Symposium on Reactor Safety, Vienna, Austria, Apr. 16-20.

American Society for Metals Regional Conference & Exhibition, Materials and Materials Processing for the Petroleum, Petrochemical & Chemical Industries, Houston, Tex., Apr. 17-19.

Conference on Sector-Focused Cyclotrons, Los Angeles, Apr. 17-20.

International Conference on Second Order Effects in Elasticity, Plasticity and Hydrodynamics, Haifa, Israel, Apr. 22-27.

Polytechnic Institute Brooklyn Symposium on Mathematical Theory of Automata, sponsored by AFOSR, ONR and USASIGC, N.Y.C., Apr. 24-26.

16th Annual Frequency Control Symposium, Atlantic City, N.J., Apr. 25-27.

International Conference on Chemistry, Paris, France, Apr. 25-May 4.

8th Annual Symposium on Instrumental Methods of Analysis, sponsored by the Instrument Society of America, Charleston, W.Va., Apr. 30-May 2.

1962 Design Engineering Show and Concurrent ASME Conference, Chicago, Apr. 30-May 3.

Second International Symposium on Cybernetic Medicine, Amsterdam, Netherlands, (date undetermined).

Directive Fixes Responsibility For Army R&D Effort on GEM

Responsibility for all research and development of Ground Effect Machines (GEMs) is assigned to the Transportation Corps, under provisions of R&D Directive Nr. 55-1, dated Jan. 18, 1962. It defines GEMs as "all developments which employ ground-cushion phenomena for support of vehicles or other military equipment."

The Physical Sciences and Air Mobility Divisions, OCRD, have been designated respectively to exercise General Staff monitorship over all research related to GEMs and over all developmental work accomplished by the Transportation Corps. The AMD will coordinate R&D activities with other Technical Services and governmental agencies.

Defense Logistics Service Center Established

Establishment of the Defense Logistics Services Center as a consolidation of most of the Armed Forces Supply Center and the Army Property Disposal Center has been effected by Lt Gen Andrew T. McNamara, Director, Defense Supply Agency. Herman C. Hangen, who was director of the AFSC, became director of the DLSC.

Temporarily located in the Munitions Building, Washington, D.C., the

CmLC Scientists Outline Space Workers' Safety

Two employees of the U.S. Army Chemical Corps Biological Laboratories, Fort Detrick, Md., played prominent roles in the recent symposium on "Extraterrestrial Biochemistry and Biology" at Denver, Colo.

The symposium was sponsored by the chemical section of the American Association for the Advancement of Science at its 128th annual meeting. Dr. Charles R. Phillips, Chief of the Physical Defense Division, USACCB, organized and chaired the symposium.

One of the highlights of the symposium was discussion of a technical paper coauthored by Dr. Arnold G. Wedum, Safety Director at Fort Detrick, and Dr. Phillips. The presentation was illustrated by a special film prepared by the scientists to show the principal methods for safety of the space worker.

These methods were outlined as: first, to put the worker in a ventilated protective suit, head hood or protective mask, and have the hazardous operation in a relatively open area; second, to put the operation in a gas-tight cabinet system, leaving the operator free outside; and third, a combination of the two.

Dr. Phillips, who is one of the specialists helping to plan the sterilization of the lunar probe planned by the United States, stated that:

"Biologists are in agreement that biological contamination of the moon and the planets should be avoided until complete biological studies of these extraterrestrial bodies are completed.

"However, biologists have warned of the dangers of introducing foreign life on planet earth. Organisms quite different in protoplasmic and genetic makeup from earth types might proliferate to overwhelming proportions."

In presenting their paper, the Army scientists attempted to stimulate thinking among space scientists about how, and to what extent, microbiological safety techniques could be used in exobiological safety.

new center will be moved later this year to Battle Creek, Mich.

The center will continue several functions of the AFSC which it replaces, including administration of the Federal Catalog System and the Defense Materiel Utilization Program. It also will assume responsibilities on a nationwide basis for disposal of surplus Defense Department property, relieving the Military Services of the management and operation of 34 consolidated sales offices in various cities.

Approximately 400 personnel of the AFSC and 50 of the APDC comprise the Center's manpower.

OCRD Regulations Detail RDT&E Responsibilities

Functions and the organization of the U.S. Army Research and Development Office, Alaska, and the U.S. Army Research and Development Liaison Detachment at Wright Patterson Air Force Base, Ohio, are set forth in new regulations.

OCRD Regulation No. 10-56, dated Jan. 22, covers the Alaskan office, located at Fort Wainwright. The office represents the Chief of Research and Development in all matters related to RDT&E in Alaska, including joint activities with the U.S. Air Force, U.S. Navy and other Government and civilian agencies.

OCRD Regulation No. 10-59, dated Jan. 29, details functions of the detachment at Wright-Patterson AFB. Its major responsibility is to represent the CRD in all matters pertaining to Army areas of interest as related to the 463L Materials Handling Support System and the C-141 aircraft development, including coordination of Army requirements.

Scientists Observe Alaskan Great Bear Exercise

Six scientists concerned with research, development, testing and evaluation of Army materiel and equipment used in the polar regions participated as observers in Exercise Great Bear, Feb. 12-21.

The 10-day exercise ranged over some of Alaska's more rugged terrain in the TOK Junction-Fairbanks complex. Some 1,700 soldiers from U.S. Continental Army Command units along the eastern seaboard were airlifted by Military Air Transport Service to join with Alaskan Command units in maneuvers covering a 3,000-mile square area.

Objectives of the exercise included field training in cold weather operations, collection, evaluation and dis-



By Dr. Ralph G. H. Siu
Technical Director, R&E, OQMG

HORN ON HIGH. During the past several months a number of people have been busily occupied with the promotion of scientists. And, as expected during periods of this kind, there was much speculation as to who should get what. Understandably, too, some of the aspirants seemed anxious over the outcome. The best advice that we can pass on to our good confreres is Verses 5-7 of Psalm 75, which Maj Gen Webster Anderson called to my attention.

"Set not up your horn on high, and speak not with a stiff neck. For promotion cometh neither from the east, nor the west, nor yet from the south. And why? God is judge; He putteth down one, setteth up another."

THE ELECTRONIC TONGUE. In 1958, Pierce and David compared the speed of speech with that of thought. They went through an analysis beginning with Shannon's Information Theory, the entropy of the message, the transmission of bits via the pulse code modulation, and finally—after 10 pages of careful reasoning (Man's World of Sound, pages 182-192)—recorded the following statement:

"I am forced to the conclusion that we can speak words faster than we can perform the most primitive mental operations concerning them. . . ."

Such an observation, as we all know in Washington, is as old as the hills. Ten minutes in almost any meeting will demonstrate the point.

semination of intelligence information, combat surveillance and target acquisition techniques, air transport and logistical command of Strategic Army Command units.

The scientific observers were: Dr. Harwood Belding, a distinguished member of the Army Scientific Advisory Panel; Lt Col Robert B. Bennett, Combat Materiel Division, Office of the Director of Developments, OCRD; Rudolph Berkhouse, Human Factors Research Division, U.S. Army Research Office, OCRD; Donald C. Hilton, Earth Sciences Division, U.S. Army Research Office; Dr. Colin Hudson, Office of the Chief of Ordnance; and Elliott Snell, Chemical and Plastics Div., QM R&E Command.

Ordinance Brochure Offers Technical Plan for Beryllium R&D

A brochure outlining a technical plan for metallurgical research and development of beryllium to meet U.S. Army requirements has been prepared at the request of the Ordnance Materials Research Office.

The plan developed by Watertown Arsenal, Watertown, Mass., aims at limited Ordnance Corps applications, within the next three to five years, of beryllium essentially similar to that now in commercial production.

A second objective is to designate major problem areas requiring effort over longer periods (5 to 10 years) to improve the structural qualities of beryllium, and to make metal possessing the desired qualities available in useful quantities.

Discussing objectives, the brochure states:

"The advantages to be realized through use of beryllium at its present rate of development are, in certain critical Ordnance applications, such that the proposed short-range research is justified now. Designation of specific problems under the long-range tasks requires careful coordination with the programs of other agencies since the importance of these areas has already focused research attention."

Beryllium is considered of "unique interest" for possible application to

Ordnance Corps requirements for greater firepower and higher mobility or transportability of weapons through weight reduction. The brochure points out that:

- On a weight basis beryllium's modulus of elasticity (a measure of the stiffness and rigidity of metals) excels that of other structural metals. Its strength compares favorably with steels and titanium alloys. Beryllium retains these advantages up to temperature of 1000° F.

- Physically, beryllium has good thermal conductivity and high heat capacity.

- In atomic power applications the metal's nuclear characteristics make it an excellent moderator or reflector of thermal neutrons.

Serious problems cited in the brochure as impeding more extensive application of beryllium at present include cost, lack of ductility and toxicity. Because it is in short supply, beryllium costs approximately \$150 a pound (cost may vary widely, depending on degree of refinement).

Possibility of increased supplies of beryllium is advanced by discovery of large bodies of low-grade ore. This knowledge is spurring research in beneficiation to develop economical treatment processes.

The Ordnance technical plan includes short-range tasks such as: optimization of the metal's microstructure, consolidation and fabrication practices, fabrication of beryllium composite materials, secondary fabrication of flat rolled products, development of machining and joining techniques, and establishment of specifications and standards.

Among long-range tasks advanced in the Ordnance brochure are: ductility improvement, purification methods for quantity production, alloy development, and medical technology and health standard procedures.

A section of the plan entitled "Analysis of Technical Requirement" states that developmental weapons systems that do, or in the future may require, beryllium metal include nuclear ammunition and nuclear power plants, field artillery missiles, missile and aircraft defense systems, and satellite systems in support of earth operations."

Although the Ordnance technical plan submitted by Watertown Arsenal does not propose immediate funding, expenditures totaling \$2,650,000 in a 5-year period are recommended. Seventy-five percent of this funding is proposed for in-service research, with the remainder to be contracted.

Helicopter Gets 48 Rockets For Armament Firing Tests

Forty-eight aircraft rockets mounted on a turbine-powered helicopter are undergoing an extensive series of test firings as part of the U.S. Army's overall helicopter armament development program.

Ground firings conducted by the U.S. Army Ordnance Missile Command at Redstone Arsenal, Ala., in recent weeks were termed successful. Flight test firings of the system are scheduled in the near future at Fort Rucker, Ala. Engineering tests will be at Aberdeen Proving Ground, Md.

AOMC ground firing tests were designed to determine effect of the blast of the modified Navy 2.75-inch folding-fin aircraft rockets on the structure of the Army HU-1B Iroquois helicopter. Mounted on each side of the aircraft is a pod holding 24 rockets. The control system permits firing in pairs.

The overall helicopter armament program is under Army Transportation Corps management. It is aimed at development of a versatile family of weapons to provide effective strik-



Army HU-1B Iroquois helicopter fitted with 48 aircraft 2.75-inch rockets.

ing power for all types of helicopters in support of ground troops under all battlefield conditions.

In the forthcoming flight test firings a test pilot from the Army Transportation Materiel Command will fly the helicopter. Tests are under direction of a Transportation Corps and Ordnance Corps team. Fire control equipment is being developed by the Army's Frankford Arsenal and

the General Electric Co. under direction of the Army Ordnance Missile Command's R&D Directorate.

Other armament under consideration for rotary-wing aircraft includes antitank guided missiles, grenade launchers and machineguns. Feasibility of such armaments has been demonstrated in test firings, and development will be a joint Transportation Corps and Ordnance Corps effort.

Transportation Corps Symposium Stirs Interest In Coordinated Crash Injury Research Effort

Aviation crash injury research initiated by the U.S. Army Transportation Corps is stimulating interest in coordinated effort of Federal and civil agencies, the Department of Defense, Armed Services and industry to expand the program.

Informal discussions have been held recently among high-level officials of the Federal Aviation Agency, the Civil Aeronautics Board, DOD and the Armed Services, and civil agencies, in meetings with Army Transportation Corps aviation crash injury research leaders.

Much of this broadened interest was generated at an Aviation Crash Injury Symposium sponsored jointly by the Transportation Corps and the Cornell-Guggenheim Aviation Safety Center, located at Cornell University. Held in Washington, D.C., in December 1961, the symposium was attended by officials of most of the agencies already mentioned.

As an outgrowth of the symposium and subsequent informal discussions, preliminary overtures are being made toward establishment of a permanent aviation crash injury coordination group. It would be comprised of representatives of the Department of Defense, the Armed Services, Federal regulatory agencies, other Government agencies such as the National Aeronautics and Space Administration and the U.S. Public Health Service, and the aircraft industries.

Modern warfare mobility requirements are leading the Army to promote research and development of advanced types of aircraft designed for all combat conditions. Aviation

crash injury research to minimize risk to personnel using aircraft under combat hazards followed naturally as a priority responsibility of the Army Transportation Corps.

Accordingly, the U.S. Army Transportation Research Command (TRECOM), Fort Eustis, Va., entered into a contract with the Flight Safety Foundation for a series of experiments. (See May 1961 issue, page 12, for a report by TRECOM's Francis P. McCourt on findings and methods used in the experiments.)

Mr. McCourt covered much of the same material as the *News* magazine article when he made one of the main presentations at the crash injury symposium in Washington. Maj Gen Dwight E. Beach, Deputy Chief of Research and Development, emphasized importance to the Army of crash injury research in opening remarks.

Dr. T. P. Wright, symposium chairman, helped to set the stage for current efforts to establish a joint coordinating committee when he led a forum discussion on the subject of "Inter-Agency Joint Program in Aviation Crash Injury Research."

Irving Pinkel of the National Aeronautics and Space Administration spoke on "The Desirability and Value of Dynamic Testing," and Col Frank M. Townsend, Director of the Armed Forces Institute of Pathology, discussed "Bio-mechanics of Crash Injury and Progressive Research Requirements."

Among other symposium speakers were: Melvin N. Gough, Director, Safety Bureau, Civil Aeronautics Board, whose topic was "Value of

Crash Injury Research and Dynamic Testing to Accident Investigation"; E. J. Griffin, Flight Standards Service, Federal Aviation Agency, "Effects of Crash Injury Research on Airworthiness Standards"; Capt R. A. Bosee, Director, Air Crew Equipment Laboratory, U.S. Navy; "Correlation and Coordination of Research Conducted by Air Crew Equipment Laboratory"; and Col Rufus R. Hessberg, Jr., U.S. Air Force Systems Command, "U.S. Air Force Activities in Aviation Crash Injury Research."

QM Biochemist Stirs Move 'Adopting' Vietnam Town

A "sister" relationship between Newburyport, Mass., and Binh Hung, South Vietnam, is the result of a campaign sparked by Pfc Walter S. Chase, a biochemist at the Quartermaster Research and Engineering Center, Natick, Mass.

It is believed to be the only such arrangement between an American town and a village in Southeast Asia.

Pfc Chase read of the determined resistance to Communist attacks by the local militia of Binh Hung despite severe shortages of equipment and supplies. He wrote to Father Nguyen Loc Hoa, a Catholic priest in the village, expressing the desire to help.

The correspondence culminated recently with the "adoption" of the Vietnamese village by Newburyport, Pfc Chase's hometown.

Through this "people-to-people" relationship, the soldier-scientist hopes to promote understanding of the problems in South Vietnam and stimulate a program of material assistance in the battle to check communism's advance in the area.

ADVENT Antenna Installed at Camp Roberts

Installation of the second 60-foot parabolic "dish" antenna to be used in tracking and communicating with ADVENT satellites has been completed at Camp Roberts, Calif. An identical antenna was installed Dec. 31, 1961 at Fort Dix, N.J. (See February issue, page 24.)

Brig Gen William M. Thames, Commanding General of the U.S. Army ADVENT Management Agency (USAAMA) at Fort Monmouth, N.J., said the two ground station antennas and a smaller antenna, with associated equipment aboard a Navy ship, will comprise the surface communication facilities for Project ADVENT.

When the Camp Roberts facilities are completed, the station will employ approximately 100 persons, working in shifts for 24-hour operation. Oper-

ations will be centrally directed from the U.S. Army ADVENT Control Center at Fort Monmouth.

Initial tests in 1962 will be conducted with an active communication satellite in a 6,000 mile high circular orbit with a period of about six hours, boosted by an Atlas-Agena B rocket. In this phase the power supply, attitude control, and tracking, telemetry and command subsystems will be tested, and orbital control functions and communication tests will be performed.

Later launches will place ADVENT satellites in the synchronous equatorial orbit. Ultimately, Project ADVENT will provide the prototype of a system for instantaneous global communications through space to meet modern military needs.



Pfc Walter S. Chase

Army Engineers Try Living in Greenland Tunnel Using 'Buildings in Barrels' Plastic Foam Shelter

Developmental research to test practicability of the Corps of Engineers' "building in barrels" concept is being carried deep inside a Greenland glacier this winter.

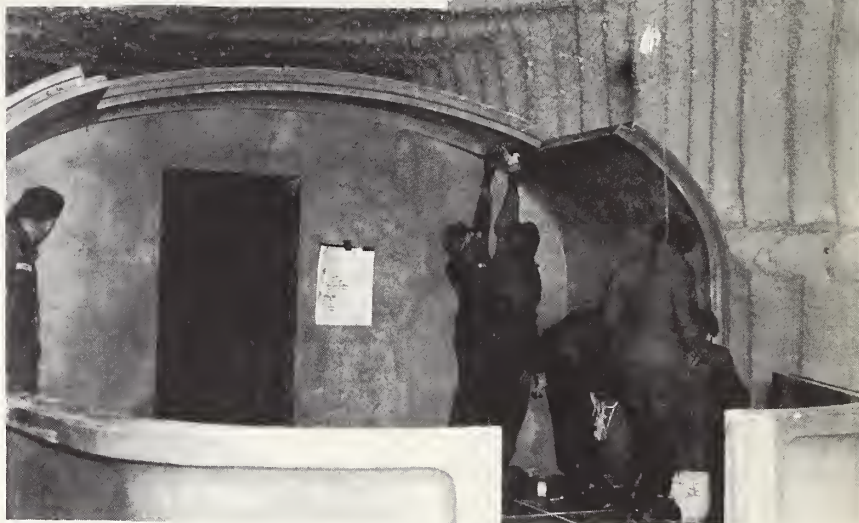
In mid-February 25 hardy personnel of the U.S. Army Cold Regions Research and Engineer Laboratory (CRREL) and the U.S. Army Engineer Research and Development Detachment (ER&DD) set up their home for a 2 to 3-month period in an excavated ice tunnel that extends 1,100 feet into a glacier at Camp Tuto. The camp is the Greenland operations base of the U.S. Army Polar Research and Development Command.

The primary purpose of the crew is to determine suitability of the ice tunnel to provide long-term shelter. That will require continuation of the Corps of Engineers' research on the control of ice plastic flow and closure—an important aspect of the problem of developing improved techniques of construction of cold regions facilities.

The men are housed in several types of buildings. One of these, being tested for the first time in the Arctic under actual living conditions, is made of foam plastic castings (Buildings in Barrels," see May issue, page 16). It is bound together with fiberglass reinforced plastic resin.

Facilities include a messhall and a recreation room with television, radio, phonograph, books and magazines, ping-pong and pool tables. Two beds, a dresser, a 2-man wall locker and wall-type indirect lighting are provided in each set of living quarters. Individual thermostats control temperature.

The installation has self-contained sewage, oil heat, and water facilities.



ERDL personnel assemble plastic foam wall section in Tuto ice tunnel.

A heat-exchange system, in conjunction with a 100-kilowatt generator, provides water by using the heat from the generator to melt ice in a hole drilled below the surface of the tunnel floor. Kitchen facilities include a garbage disposal unit and a continuous hot-water heater that produces 200 gallons of 180-degree water per hour.

As part of the research, several types of electric and oil-fired heaters are being tested. Comparatively little fuel is required to raise the temperature. It takes less fuel, for example, to raise the temperature from 17 degrees to room temperature in the still air of the ice tunnel than it does to heat New England houses a similar amount in winter gales.

The ventilation system utilizes the ice walls of the tunnel as a heat reservoir to regulate the temperature,

thus stabilizing tunnel temperatures. A 30-inch steel ventilation line extends the length of the tunnel. Fresh air is sucked into the tunnel through the portal roof.

An 8x20-foot room was hand-mined rather than machine-cut, specifically for research purposes. Eventually it will be bulk-headed, pressurized, and instrumented to determine if plastic flow in the ice and closure of the ice opening can be arrested. If this is successful, engineers will then determine the amount of pressure required for specific sizes of openings and depths of ice cover.

The tunnel project is another first in a continuing series of efforts by the U.S. Army to acquire knowledge, through research, of how to live and carry out a military mission under conditions in any part of the world.

Chemical Corps Honored For 1961 Safety Record

Seven high National Safety Council (NSC) honors for 1961 safety records were awarded to the Army Chemical Corps in a ceremony held on Feb. 5 in Washington, D.C.

Based on a reduction of accidents, injuries, fatalities and the costs involved, the awards brought to a total of 17 the number of honors earned by Chemical Corps safety practices since 1950.

Commanders of award-winning organizations were present when NSC President Howard Pyle presented to Maj Gen Marshall Stubbs, Chief Chemical Officer, the 1961 "National Safety Council Award of Honor for Safety." The award was made to

the Chemical Corps as a whole.

The Award of Honor also was made to the Chemical Corps R&D Command, Washington, D.C.; the Army Chemical Center and the Chemical Corps R&D Laboratories, both of Edgewood, Md.

Honored with the "National Safety Council Award of Merit for Safety" were the Chemical Corps Engineering Command; Edgewood Arsenal, Edgewood, Md.; and Dugway Proving Ground, Dugway, Utah.

Last October the Chemical Corps received the highest Department of the Army Award for 1961 for the best safety record among the Technical Services.



Laborious hand-chipping method was used in early excavation of tunnel.

CmlC Weapons Development Rising to Technology Tempo Challenge

In accomplishing one of its basic missions, that of coordinating chemical and biological R&D programs for the Armed Forces, the U.S. Army Chemical Corps is continuously involved in development and standardization of new weapons and weapon systems.

Chemical Corps civilian and military scientists, working effectively as a team, have been particularly diligent since the Korean War—in response to the greatly accelerated tempo of technological progress—to provide combat troops with the most advanced CB weapon systems.

One of the most spectacular new weapons is the M7 A1-6 Flame Thrower. Normally mounted in the turret of a tank, it has an effective range of 180 yards and sufficient fuel capacity to make it a devastating weapon.

Work is now underway to provide systems similar to the M7 A1-6 Flame Thrower for newly developed armored personnel carriers, in line with the Chemical Corps' constant emphasis on adapting new weapons to a wide range of uses and vehicles.

Another effective advancement is the Portable Flame Thrower, M9-7, which can be carried and fired by the individual soldier. Carried on a back-mounted "pack-board" frame, this new unit is far lighter and more effective than World War II and Korea types.

The M9-7 "gun type" nozzle, igniter and trigger mechanism have been improved for greater range and simplicity of action. In the hands of the combat soldier, this weapon can provide any unit with "great balls of fire" that can be placed upon a protected enemy position with unerring accuracy.

A new type of grenade, the M34,



Mechanized Flame Thrower, M7 A1-6.

firing varied types of chemical ingredients, also has been developed for use of the individual soldier. It can be thrown by hand or attached to a finned rocket-type adapter for rifle launching.

Four new hand-thrown grenades, of the non-frangible aerosol and burning dispenser varieties, have been added to the grenade family of weapons for riot control and other uses.

The newest riot control weapon is the M3 Irritant Gas Dispenser. Because of the back-mounted tanks and the gun-type nozzle, the dispenser might well be mistaken, at first glance, for the nearly identical M9-7 flame thrower.

The newly perfected M4 Irritant Gas Dispenser is adaptable to either vehicle or helicopter use. It is an exceptionally effective riot control weapon with many uses.

When mounted in a hovering helicopter, the M4 Dispenser has the added help of the rotor blades to provide a fast and effective means of spreading the irritant agent over a



Mounted Irritant Gas Dispenser, M4.

much wider area than can be provided by ground dispersal methods.

Land mines have always been the bane of the forward progress of the foot-soldier. When filled with high explosives, they can destroy a large vehicle and kill or disable a large group of men. To increase the effectiveness of this weapon, the Chemical Corps has developed the M23, a new chemical agent mine.

Probably the most impressive of all the newly developed systems is the "area toxic rocket" consisting of the rocket and M91 Launcher. This weapons system utilizes a rack of 45, electrically fired free-flight rockets, which can be easily transported by air or truck.

The 7-foot, 4½-inch diameter, solid-fuel missiles carry a chemical warhead and have range and dispersal characteristics insuring the field commander of highly potent combat capabilities. They can be loaded and fired in less than 20 minutes.

The mission of the U.S. Army Chemical Corps is to provide the Armed Forces with the latest chemical and biological protective equipment and weapons. Progress is continuous, an official stated, "to insure a deterrent capability as well as a constant combat readiness in the event of an attack upon our Nation."

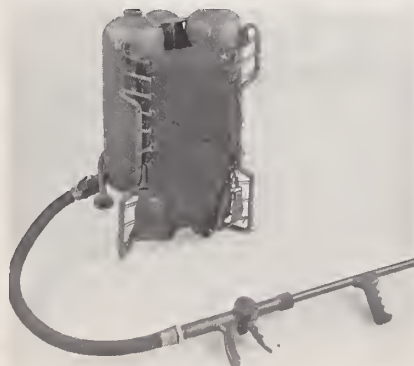
CmlC Scientist to Present Paper

"Semantic Information," a technical paper dealing with advanced mathematics, will be presented by Clifford J. Maloney of the U.S. Army Chemical Corps, Fort Detrick, Md., to the International Congress of Mathematicians in Stockholm, Sweden, Aug. 15-22, 1962.

The paper will also be delivered to the Third International Congress on Information Processing in Munich, Germany, Aug. 7-Sept. 1, 1962.



M91 racks 45 electrically-fired rockets.



M3 Portable Irritant Gas Dispenser, newly developed riot control weapon.

Army Awards Contracts Totaling Over \$70 Million

Contracts for equipment and services totaling more than \$70 million were awarded recently by the Department of the Army.

The largest contract, \$30,977,000, went to De Havilland Aircraft of Canada, Ltd., for production of 53 AC-1 Caribou aircraft. The Caribou is a twin-engine short-takeoff and landing (STOL) transport planned as a short-haul transport for battle areas.

Two contracts totaling \$2,905,105 let to the Ford Motor Co. call for production of 417 dump trucks and 467 stake and platform trucks. International Harvester Co. received a \$2,803,835 contract for 762 cargo trucks. A \$1,525,761 contract was awarded to Western Electric Co., for Nike Hercules technical manuals.

A \$1,199,000 letter contract let to Bridgeport Brass Co., Division of National Distillers and Chemical Corp., Riverside, Calif., is for production of rocket motors and motor closures for the M-72 light assault weapon.

A \$1,037,785 contract to FMC Corp., San Jose, Calif., is for production of 25 Pershing missile carriers.

Western Gear Corp., Seattle, Wash., was awarded a \$1,898,330 contract for five 60-ton BARCS, a self-propelled amphibious lighter.

General Dynamics Corp., Pomona Division, Pomona, Calif., received a \$10,700,000 supplemental contract to a letter contract for continued re-

search and development on the Mauler missile system.

A \$4,682,905 contract awarded to Aerojet General Corp., Downey, Calif., is for 105 mm projectile parts.

Two contracts totaling \$3,214,906 awarded to International Harvester Co. are for 700 truck-tractors.

Contracts for 105 mm. ammunition were let to Firth Sterling, Inc., Pittsburgh, Pa., in the total of \$3,030,500 and to Temco, Inc., Nashville, Tenn., for \$3,241,664.

Thiokol Chemical Corp., Bristol, Pa., received a contract for \$3,903,266 to produce rocket motors and Jato units.

Hercules Powder Co., Wilmington, Del., has a \$4,825,833 contract for production of rocket motors and ammunition propellants. The Sperry Utah Co., a Division of the Sperry Rand Corp., Salt Lake City, Utah, was awarded a \$3,593,031 contract for engineering on the Sergeant missile.



Proper use of ice and snow can be the key to recreation and survival in the Arctic. Maj H. R. Eidem (left) Commanding Officer at Camp Century, U.S. Army Polar R&D Center, Greenland, accepts key of ice and snow from Capt W. W. Watkins, Jr., Welfare & Morale Officer, at Polar Bear Club opening.

DOD Supply Agency Establishes Electronics Center

Progress of the new Defense Supply Agency in consolidating and integrating supply management for military requirements is reflected in the recent establishment of the Defense Electronics Center.

Located in facilities formerly designated as Gentile Air Force Station, Dayton, Ohio, the Center has 390,000 square feet of administrative building space. Automatic data processing equipment includes the Sperry Rand 1105, IBM 650B and the Univac 1, supported by punch-card equipment.

Dayton Air Force Depot, on the same site, provides worldwide transceiver capability and maintains access to Army and Navy communications systems. Installation of a high-speed data communications system able to interchange traffic with other military teletype and data networks is expected to be ready by Oct. 1.

Magnitude of the Center's operations is indicated by an anticipated inventory of about \$400 million in FY 1963, with an increase to \$500 million in FY 1964. Procurement during the first year of operations is expected to reach \$143 million and to increase to \$198 million the second year. Estimates place sales to the military services at \$165 million in FY 1963 and \$220 million in FY 1964.

Brig Gen William W. Veal, USAF, has been named Center commander. A planning staff of 100 military and civilian personnel will be provided by the Military Services. Manage-

ment of selected items of electronic material is scheduled to begin July 1.

The Armed Forces are currently managing and distributing electronic parts in the United States as follows:

Army—Signal Supply Agency, Philadelphia, Pa., depots at Tobyhannan, Pa., Sacramento, Calif., and Lexington, Ky., and off-site warehouses at Fort Worth, Tex., and Atlanta, Ga.

Navy—Electronic Supply Office, Great Lakes, Ill., and depots at Oakland, Calif., Norfolk, Va., and Bayonne, N.J.

Air Force—Gentile Air Force Station, Ohio, and Rome, N.Y.

Neptune Jaycees Pay Tribute To Signal Laboratory Employee

An employee of the U.S. Army Signal Research and Development Laboratory, Fort Monmouth, N.J., was presented the Neptune, N.J., Junior Chamber of Commerce Distinguished Service Award on Jan. 25.

Mr. James I. Plummer was honored at a dinner sponsored by the Jaycees for his community service activities in the PTA, Boy Scouts, other youth groups, Neptune Civic League and American Legion Post No. 266. He is an electronics engineer.

Another USASRD employee, Wesley Matther, a physicist, shared runner-up honors for the award with Martin Green, Jaycee president.

SC Expects 800 to Attend Frequency Control Parley

More than 800 representatives from industry and governmental agencies are expected to attend the Sixteenth Annual Frequency Control Symposium, Apr. 25-27, Atlantic City, N.J.

Recognized as the Nation's top annual meeting in frequency control and related subjects, the symposium will be conducted by the U.S. Army Signal Research and Development Laboratory's Solid State and Frequency Control Division, Fort Monmouth, N.J.

About 30 technical papers will be presented on such subjects as piezoelectric resonators, fundamental properties of quartz, crystal oscillators and filters, masers, gas cells, atomic beam devices and applications of atomic frequency standards.

Two general discussion periods on quartz crystals and circuitry and on atomic and molecular resonance phenomena will also be conducted. Participants will include experts from many Free World nations.

Newsmagazine Draws Plaudits, Plans Expansion to 36 Pages

Solicited comments from major Army R&D activities relative to desired improvements in the *Army Research and Development Newsmagazine* were made in the kindly spirit of tolerance and understanding. Comments, in fact, were generously laudatory. Particularly gratifying to the editorial staff was the view of the R&D Division, Chief of Ordnance, that:

"Excellence of the Newsmagazine and its continuing improvement make it difficult to suggest improvements. . . ."

Nonetheless, Cloud 9 occupancy is a privilege to be enjoyed but briefly. Much as they might like to bask in the warm glow of complacency, the editors must concede to the adage that "one must progress or retrogress—there is no happy hunting ground in between." Accordingly, continued improvement of the Newsmagazine is as constant a goal as the hope of a better tomorrow.

Practicality, however, imposes certain realistic limits—roadblocks in the path of progress (to lean upon a corny cliché!) which can be surmounted only with a great deal of outside help. Voluntary contributors are the lifeblood, the backbone, the heart of this publication.

Considering that their contributions cannot be rewarded except by a by-line, or perhaps the satisfaction of reporting on progress or problems that may be of interest throughout the broad Army R&D establishment, the voluntary authors should receive special thanks for having helped immeasurably to build whatever esteem the Newsmagazine may have achieved.

Without the Technical Liaison Offices, the PIOs, the Press Relations Offices, the multiple other news dissemination agencies, and the unpaid contributors who have pooled their resources in giving this publication a much-needed helping hand, it might well have "died aborning." Without continued help, it cannot improve.

Dependence upon outside help is explained by the fact that the editorial staff has varied from a high of three men to a low of one during the 16 months of its existence. Collection of the news, rewriting, editing, proofreading, pictorial layout, makeup—all the mechanics of production—are handled by that staff.

One of the remarks made in response to the call for suggested Newsmagazine improvements was that "its scope is too broad; it tries to be all things to all people." Offsetting this perhaps justifiable observation were numerous statements that the publication is "much needed," is of

"great value," is doing a "fine job" . . . but "could be improved by adding. . . ."

When the Newsmagazine was in the planning stage, many skeptics said it was foolhardy to try to publish it once a month. They held that it would be impossible to collect 24 pages of readable material each month. They suggested a bimonthly or quarterly publication. Planners held firm to the belief that timeliness dictated at least a monthly periodical.

Confidence in the news-producing capability of the widely dispersed Army R&D establishment proved sound. Within a short while the editorial staff found that its most difficult problem was that of giving adequate representation to all the activities, meanwhile maintaining a reasonable balance among the scientific disciplines, within the limit of 24 pages.

Consequently, some unorthodox journalistic techniques were employed to crowd in as much news and feature material as possible. Headlines were kept small. White space around illustrations and headlines was held to absolute minimum. Six-point boldface and italic paragraphs were used to serve a dual purpose of conserving space (doubling the word count in that space) and at the same time to create an eye-appeal break in type size that eliminated the need of space-consuming breaker or side heads.

While that technique effectively served its purpose, some readers expressed disapproval of the small type, the "crowded appearance." In fact, response to the request for suggested improvements focused on that point more than any proposed change.

Corrective action, however, already had been initiated. On Jan. 31, the suspense date for submission of suggested improvements, the Army Publications Board approved a request to authorize expansion of the Newsmagazine from 24 to 36 pages.

Provided voluntary assistants submit an adequate amount of usable material to support the news-gathering activities of the editorial staff, the next issue of the Newsmagazine will be a 36-page edition. In the meantime, careful consideration is being given to all of the suggestions for improvements. One of these is that better illustrative material be used, particularly pictures with more dramatic action appeal.

The need for better pictures had been recognized by the editors for many months. Since the Newsmagazine does not have a staff photographer to send out on special assignments, nor a staff illustrator, it is totally

dependent upon contributing agencies for photos, charts, graphs, maps and similar graphic art. It is suggested that enterprising thought be given by the contributing agency or individual to the possibility of producing the best possible illustrative material for news and feature articles.

Restatement of one of the basic policies of the Newsmagazine is occasioned by one of the suggestions for improvement, specifically, that "articles should be more technical in substance . . . more mathematical and scientific coverage would give the essential scientific flavor."

That policy is: News and feature material will be written in simple, readable layman's language, with a minimum of technical terms, so as to be easily understandable. In no way is the publication intended to substitute for or compete with the professional scientific and engineering journals, each of which usually is designed to appeal to readers in a specific discipline or field of interest.

Because the Newsmagazine is intended to appeal to Army R&D personnel across all the scientific disciplines, and to personnel from the top administrative level to researchers and technicians at bench level, it must continue to be suspect of "trying to be all things to all people." Its range of subject material is broad. It attempts to present material that accurately reflects the Army R&D effort and is of general interest.

To accomplish its purpose effectively, the Newsmagazine needs voluntary "super snoopers," self-appointed reporters, that is, in every Army R&D activity. To our readers may we suggest that they be constantly alert to the possibility of reporting on some newsworthy phase of their work that may be helpful, or productive of cross fertilization of ideas, to personnel in other Army R&D installations.

The proper channel for submission of all material to the Newsmagazine is through the installation Technical Liaison or Public Information Office. This is intended to insure adequate review for policy and security protection prior to submission.

However, if you have what you consider a good idea for an article and would like to determine whether the Newsmagazine has an interest prior to going to the trouble of preparing it, you are encouraged to call the editor or have the TLO or PIO do it for you. The telephone number for use of Government employees in Washington is Code 189, ext. 2452; otherwise, Jackson 5-5800, ext. 2452.

Gas Turbine Overland Train Undergoing Tests To Increase Mobility in Undeveloped Regions

FLARE



Acceptance of the gas turbine "Overland Train," considered an impressive advance in the Department of the Army's continuing R&D effort to achieve logistics mobility under all conditions of terrain and climate, was announced Feb. 21.

Termed the "world's longest rubber-tired vehicle," the 572-foot train (almost twice as long as a football field) was unveiled at Longview, Texas, and will undergo further service tests at Yuma Test Station, Ariz.

Developers said the train is designed to provide maximum mobility and high cargo-carrying capacity in remote, undeveloped areas such as polar and desert regions, where supply routes are long, fuel supplies scarce, and roads nonexistent.

Operated by a 6-man crew, the

R&D Film Report 16 Available At Signal Corps Libraries

Research and Development Film Report No. 16 is now available on request to Army Signal Corps film libraries. The 24-minute report is classified Confidential and covers the following subjects:

"High-Altitude, Low-Opening Parachute," "Lighter Amphibious Resupply Cargo, LARC 15-Ton," "Rough Terrain Crane," "Operations Center Equipment, AN-MSQ-19," "Cartridge 56 mm: XM110," "Grenade Launcher, 40 mm M-79," "Antitank/Assault Weapons (light and heavy)," "The ENTAC," "HU-1 Iroquois with SS-11," and "Honest John's Chemical Warhead."

vehicle is made of a lead (control) car, two power cars and ten 4-wheel, individually powered 15-ton cargo-carrying trailers. Their capacity of 150 tons equals 60 2½-ton trucks.

Quarters for the crew are in the control car, which is equipped with radar and communications equipment. Three Solar T-1,000 gas-turbine engines totaling 3,500 h.p. in the power cars at the rear drive generators which supply electricity to the individually powered wheels.

An impressive feature of the train is the 10-foot high, low-pressure tubeless tires, which provide mobility for

travel over dozed-out trails or across open country. Feasibility of the off-road concept has been determined through extensive tests of a 4-unit train under widely varying climatic and environmental conditions, including long trips on the Greenland Ice-cap during recent months.

The train was designed and produced by the joint efforts of the U.S. Army Transportation Corps and R. G. LeTourneau, Inc. Military officials said it is expected to open new horizons and capabilities in the ever-increasing problem of military supply and resupply in remote regions.

10-Yr. Test Proves Acetate Shield Durability

A 10-year experiment to test longevity of a plastic "armor" protective shield for finely-precision gauges has ended successfully, at the Watervliet Arsenal gauge laboratory, Watervliet, N.Y.

Dipped in a viscous, 350-degree solution of cellulose acetate butyrate exactly a decade before, the test gauges—used to insure the interchangeability of weapons parts—were stripped of their 8-inch thick coatings of clear, solidified plastic on Jan. 25. No air, dust or moisture had penetrated the shield.

First used at the Arsenal in 1950, the acetate replaces the previous method of coating instruments with greasy cosmoline. Cosmoline eventually hardened and cracked. The acetate "sweats" oil to keep the

gauges rustfree. The plastic shell is quickly removed with an ordinary knife, doing away with the tedious task of cleaning cosmoline from the delicate parts.

As headquarters for all Ordnance Corps gauging operations, the Arsenal each year ships more than 10,000 gauges of all sizes. Values range from \$200 to \$12,000. Substantial savings result from shipping several gauges in a single container, permitted by the shield's hard protective coating. Its transparency makes the gauge nomenclature easily discernible.

A study by Ordnance Corps field experts indicates possible wider application of the Arsenal "armor." Cellulose acetate butyrate may eventually be used to sheathe many other Ordnance Corps items in storage or during shipment.